Soil News

Issue # 4 – Vol # 65 – November 2017

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New Zealand Soil News

Newsletter of the New Zealand Society of Soil Science

ISSN 0545-7904 (Print)
ISSN 1178-8968(Online)

Volume 65 Number 4 November 2017

Your contributions are required - New Zealand Soil News is your newsletter

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Deadline..... For the February issue of Soil News is Friday 16th February **2018**

Theme for next issue: Going Digital

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New Zealand Soil News

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Editorial: Soils and Climate Change by Tony van der Weerden

The new coalition government is committed to reducing NZ's greenhouse gas emissions by 30% by 2030 compared to 2005 levels, meeting its obligations of the 2015 Paris Agreement. The government is also committed to the goal of being a net zero emission economy by 2050, establishing an independent Climate Commission similar to that in the UK, and including agriculture in the Emissions Trading Scheme (ETS). They also plan to establish a Transitions National Science Challenge 'to consider the science, research and development required for the transition to a low-carbon economy'.

This puts the spotlight on the science community to develop mitigation tools and technologies that can be seamlessly integrated within farming systems. Farmers are under continued pressure to reduce their footprint on the world, given the corresponding focus on nutrient and contaminant losses to water bodies, while trying to remain economically sustainable. And this against a backdrop of a changing climate.

So what climate change mitigation and adaptation research is underway? And how does it relate to soils? Below is a quick overview of recent and current mitigation and adaptation research activities.

Climate change adaptation research

Let's start with adaptation. There has been a relatively modest investment in improving our understanding of the impact of climate change on soils, and, more widely, on farm systems and communities. Several studies suggest that intensively managed agricultural systems are likely to benefit from the long term effects of climate change through increased biomass, primarily due to carbon dioxide (CO_2) fertilisation effects where water inputs (natural or managed) are not restricted. However, in drought-prone regions (mainly eastern regions), lower rainfall is likely to make soil more vulnerable to water repellency. This will have an obvious impact on the ability of soils to store those precious drops of rainfall, particularly for extensive sheep and beef operations.

Over time, soil carbon stocks may increase through greater biomass accumulation and root exudation, although increased respiration may see stocks decline. Therefore, the directional change in soil C stocks under a range of land uses are considered uncertain. Whatever directional change occurs will impact on soil N supply. However, it is predicted that N leaching and nitrous oxide emissions via denitrification processes are likely to increase.

There are still many knowledge gaps relating to the impact of a changing climate on soils and agriculture. One area that I feel needs greater focus is increasing our understanding of the impacts of more frequent extreme weather events such as intense rainfall, wind and droughts. This understanding will help us to design and implement farming systems that are buffered against the changes that have been forecast.

Greenhouse gas mitigation research

While agricultural greenhouse gas emissions include enteric methane from ruminants, I will focus solely on soil-borne or soil-related emissions. Nitrous oxide is the second most important agricultural greenhouse gas (after methane), with 95% of these emissions coming from soil. Current research into mitigation strategies include next generation nitrification inhibitors, irrigation management, low greenhouse gas feeds (this not only can reduce nitrous oxide, but also methane emissions), soil pH management and acceleration of nitrous oxide reduction. These are all valuable research areas, most of which are still in the discovery and/or development phase. Promising options will need to be tested at a farm systems level in collaboration with end-users. (In fact, end-users need to be engaged right from the start).

Increased soil C storage is also a possible mitigation strategy. However, many of NZ's mineral soils already contain relatively high C levels, therefore are at risk of C loss under some farming practices. For example, research has shown that irrigated soils can lose soil C, presumably due to respiration activity being greater than C accumulation from roots and shoots. Others have shown that some NZ soils have the potential to

store more C than what is currently measured. For both of these projects, it'll be interesting to follow impacts on other soil processes such as N cycling and losses.

Where to from here?

Moving forward, we have new challenges to consider. We need to research how best to manage our soils and landscapes while ensuring the rural sector remains financially healthy. Our ability to achieve this relies on us working closely with other key science disciplines and conversing with farmers, iwi, sector leaders, industry groups, and regional and government authorities. Bringing together different viewpoints, knowledge and needs, we will be able to co-design and implement farm systems and land use decisions that are economically sustainable with emission profiles that are acceptable to the local and global community. With soils being the foundation of agriculture, soil science has a critical role to play.

Tony van der Weerden
AgResearch Ruakura

Society News

Message from the President

Kia ora NZSSS members. With November nearly over and the arrival of conference season, it's certainly time to look back and wonder how 2017 progressed so quickly. While it is the in between year of our traditional biennial conference, there are still plenty of regionally- based events to look forward to based around the Norman Taylor (a prominent pioneer NZ soil pedologist) memorial lecture series. This year the lecture will be given by **Professor Tim Clough** from Lincoln University. A separate notice in this edition will describe in more detail the time, location and content of Tim's talks. In addition, the Waikato-based event is designed to combine with the WaiBOP soils day on December 5th (World Soils day); a one day workshop/mini conference held at the University of Waikato. I look forward to seeing many of our upper North Island NZSSS members there.

During September we held an email ballot of our membership with regards to the International Union of Soil Sciences (IUSS) election for Division & Commission chairs and deputy chairs. All of these results have now been forwarded on to the IUSS with each constituent society being granted 1 vote per elected position. It was pleasing to see very strong support for both of our NZ candidates: Megan Balks and Leo Condron. The overall outcome will not be determined by the IUSS until early in the new year.

In the last edition I proposed an increase in our membership fees (the first in many years) as a way of holding the line on our existing cash balance while continuing to provide our existing member services, including significant support to our next generation of soil scientists through awards and subsidised conference attendance and travel allowances. I can now confirm that the following table will be presented by our treasurer Haydon Jones at the Society's SGM on December 5th in Hamilton from which we will seek an endorsement from the membership. In summary we propose a $20 pa increase in normal membership fees and a $10 increase for student and retired members.

	Current fees		**Proposed fees**	
	If paid by 31 October	If paid after 31 October	If paid by 31 October	If paid after 31 October
Standard NZ member	$60	$70	$80	$90
Student member	$35	$45	$45	$55
Retired member	$35	$45	$45	$55
Library member	$70	-	$90	-

Wearing my recent 'Our Land and Water National Science Challenge Theme Leader (Land)' hat I thought I would provide a brief update on the process for seeking Tranche two funding from MBIE for July 2019 onwards. With a potential $70 M up for grabs this is obviously an important piece of research for the soil science domain to contribute to the challenge's mission of "enhancing primary sector production and productivity while maintaining and improving our land and water quality for future generations". Thanks to all of you who have participated on behalf of your respective organisations in providing material that will allow the compilation of an updated 'Research landscape Map'. Along with planned stakeholder interactions and strategy alignment during the first quarter of 2018, this updated landscape map will be essential for determining R&D gaps and priorities to be addressed as part of the proposed Tranche 2 programme. The initial strategy document is due with MBIE in early July 2018

Finally from me a congratulations to Professor **Rich McDowell** for his recent selection as fellow of the Royal Society, a nomination led by the NZSSS council. The RSNZ website had this brief message associated with their communications: "Professor Richard McDowell, AgResearch, Lincoln, is an international authority on the management of contaminant losses from agricultural land and their impact in freshwater, particularly phosphorus. The Royal Society's nomination summary highlights his ground-breaking research (and > 400 well-cited publications) and exemplary national and international leadership into the quantification, impact and management of contaminant loss from land to freshwater (especially phosphorus). His work informs and underpins policy both within New Zealand through industry guidelines, Regional Council limits and New Zealand's National Policy Statement on Freshwater Management and overseas. (https://royalsociety.org.nz/news/2017-new-fellows/)

Regards Dave Houlbrooke – NZSSS President

Volunteers needed - World Soils Day – Hamilton family fun event at Waikato Museum 10.00am-2.00pm on Saturday 9 December

We are planning a world soils day event in collaboration with the Waikato Museum targeting children.

Planned activities include finger painting with soil, play with clay, building a soil profile in a jar using layers of different soil materials, and a short talk about Discovering soils and landscapes.

If you are able to come along and help you would be most welcome (or put it in your diary to bring your kids along to join the fun) – please contact Megan Balks megan.balks@waikato.ac.nz

Minutes

Meeting of the NZSSS Council held 1:30 p.m. – 4:30 p.m. Tuesday 1st August, by Video conference.

1. Attending: Megan Balks, Haydon Jones, Dave Houlbrooke, Reece Hill, Tim Clough, Brendon Malcom, Roger McLenaghan (required to leave early at 2:15), Sam Carrick (joined meeting at 1:50)

2. Apologies: Mike Hedley, Selai Letica, Hamish Lowe.

2. Secretariat
   - Minutes of last meeting (16th May 2017) were read, minor amendments were made it was moved that these were a true and accurate record (moved Tim/seconded Roger)
   - Matters arising from the minutes were added to General Business on the agenda.
   - Items for General Business were added.
   - Agenda was approved (moved Tim, seconded Megan)
   - Membership: New membership applications were received from - Connie Daws, Hayley Jensen, Thomas Caspari and Sarah Whiteman, Librarian Waikato Regional Council, Aimee Robinson. It was moved these applications be accepted (moved Tim/seconded Roger). There were no resignations or deceased members. Including new members total membership sits at 369.
   - Secretariat activity summary was presented.

3. Treasury
   - Balance sheet up to 30th June 2017 shows total assets $166,795 with liabilities $0
   - Profit & loss from 1 July 2016 to 30 June 2017 shows an income of $28,505 (mainly subscriptions) and operating of $39,290, a net income of ($10,786) which is negative due to awards and conference expenses (student support).
   - Aged receivables consist of $3,480 in overdue subscriptions and $18,645 in current subscription charges (only just sent out to members).
   - Haydon has drafted a forecast budget for a 2-year cycle (needed due to biennial conference cycle):
     - Continued level of student support would mean continued losses, even if conferences made a small $10K profit.
     - To break even, with current level of student support ($9K per annum) would require increasing income by $15K per year and reducing costs (e.g. need to determine if annual $1K fee for conference calling is now still needed if we continue to use AgResearch VC system).
     - Proposed that subscriptions be increased by approximately $5 per student member and $10 per full member, this would increase revenue by ca. $3,200. Also seek to get more sponsorship for key events.
     - It was moved that "Council members accept the alternate budget that seeks a break-even point by June 2019 by cost reductions and modest subscription increases" (moved Haydon/seconded Megan).
     - Any actual increases will need to be voted on at next NZSSS meeting (Special General Meeting in December)
     - *Action: David & Haydon to place this information and justification in Soil News.*

4. RSNZ constituent organisations meeting.
   - Haydon reported back on meeting of the RSNZ constituent organisations held 20th July.
   - RSNZ have rebranded as Royal Society Te Apārangi.
   - Making a push to be more representative of its contributing organisations
   - Haydon noted there was discussion of a new bill dealing with how incorporated societies function, that may have implications for NZSS, so 'watch this space'.

5. IUSS elections and IUSS membership fees
   - NZSSS have received an email from IUSS querying why we pay fees on a lower membership number than stated in our Soil News publication. Dave followed this up with

RSNZ who have now taken on paying subscription fee for NZSSS ($1,680 USD). If RSNZ do not continue to do this then would need to recover cost through other means.

- IUSS elections upcoming.
- *Action: Dave to organise email to members outlining voting options. Brendon volunteered to be returning officer.*

6. Awards
   - Nominations now closed with several entries received across awards.
   - Brendon will organise judging panels.
   - Bert Quin has agreed to continue funding his award.

7. Soil News
   - Next issue due out end of August
   - Dave has noted Groundwork have experience at electronic newsletters so will liaise with Gina on this and see if Groundwork offer anything NZSSS would see as valuable in terms of Soil News delivery.
   - *Action: Dave to talk with Hamish on putting link to Soil News/delivery of Soil News via the RSNZ supported NZSSS www page.*

8. RSNZ website provider changes & NZSSS World Wide Web Pages
   - Hamish required to provide update on this.
   - *Action: Dave to talk with Hamish on this.*

9. Correspondence
   - Ballance Fertiliser wrote enquiring about planned conferences by the NZSSS and Dave has replied noting our next conference is 2018.

10. Promoting soil science
    - Megan noted the status quo is being supported.

11. Soils in the NZ Landscape
    - Eight school fairs have received books to date

12. Conferences
    - *Action: Dave to talk with Cecile re Queenstown conference report.*
    - Hawkes Bay-Napier conference shaping up well. Theme of 'Diverse Soils – Productive Landscapes' centred around 'soil to plate'. Potential session topics being developed, and sponsorship being sought.

13. General Business

    - Soil mapping protocols (Megan)
      - Megan mooted the idea of NZSSS endorsing soil mapping standards. Discussion followed on this with the consensus being NZSSS experts should be involved in appropriate peer-review panels.
    - Sam clarified that his generous funding of soil judging sponsorship should be seen as a 'one-off' event.
    - New Zealand Grasslands Association
      - Dave followed up with NZGA regarding special forums, expressing NZSSS's desire to be supportive but that NZSSS need to know potential costs involved.
    - Australian Soil Science Society
      - Regarding accreditation schemes we await Hamish's comments on this.
      - Action: Tim to investigate progress Trans-Tasman executive meeting.

14. Next Meeting date
    - November 2017

One-day conference: 8.30 am-5.00 pm, Tuesday, 5th December, 2017
MSB1.05, Hillcrest Rd, University of Waikato, Hamilton

FINAL NOTICE

The fourth one-day regional conference of Waikato-Bay of Plenty-based soil scientists and students is to be held on **World Soils Day, Tuesday 5th December, 2017,** University of Waikato, Hamilton, from **8.30 am to 5.00 pm.** The venue will be open from ~8.00 am for registration and uploading session-1 talks. The deadline for submitting papers has passed but there is still an opportunity to attend the conference: please email David Lowe urgently to book your place (david.lowe@waikato.ac.nz) if you have not already done so. Conference registration is free and the venue and refreshments are being provided via generous sponsorship by **Waikato Regional Council, Landcare Research, AgResearch, NZSSS,** and **University of Waikato.** We are very grateful to these organisations for such good support. Our only stipulation to attend is that that all participants must be paid-up members of the New Zealand Society of Soil Science (NZSSS), and they must have contacted David Lowe beforehand so that appropriate catering can be organised. Society membership application forms are available on the website: http://nzsss.science.org.nz/join-us/. First-time student membership is $35.

The venue is room **MSB1.05**, Management Studies Building, Hillcrest Road (see http://www.waikato.ac.nz/contacts/map/) (MSB and venue are near the pedestrian crossing on Hillcrest Rd). Car parking on campus (which will cost a few dollars for the day) is available at Gate 1 or Gate 2B Knighton Rd, or Gate 10, Silverdale Rd. Please allow at least 10-15 minutes to walk to the venue from these distant car parking areas. We have more than 20 talks scheduled for the day, including an opening keynote presentation at 8.35 am by Peter Singleton, "Challenges for resource management". Some student awards will also be announced and presented during the meeting by officers of NZSSS, and a short SGM of the society will be held from ~12.10-12.30 pm.

The conference is to be rounded off with the N.H. Taylor Memorial Lecture for 2017 by **Professor Tim Clough** (Lincoln University) (left) from **4.00-5.00 pm**. His lecture is entitled "Developing integrated approaches to nitrogen management: defining soil's role". If you just want to attend the Taylor Lecture, but not the conference, then you are very welcome to come along to MSB1.05 (Management Studies Building) on Hillcrest Rd, Waikato University, from ~3.30 pm for afternoon tea before the lecture starts at 4.00 pm on Tuesday 5th December.

David Lowe, Louis Schipper, Megan Balks, Tanya O'Neill
Convenors, WAI-BOP SOILS 2017
20 November 2017

Obituary – Willem 'Wim' Cornelis RIJKSE (1936–2017)

David J. Lowe[1], Philip J. Tonkin[2], David M. Leslie[3], and W.E. 'Bill' Cotching[4]

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Introduction and summary

Members of the soil science and especially pedology communities of New Zealand and beyond were saddened and reflective at the passing of Wim Rijkse on 23 September this year. One of the most experienced, truly 'grounded' pedologists ever to work in New Zealand, Wim developed a special affinity for soils formed from volcanic ash (tephra), and he also undertook benchmark surveys in many parts of northern New Zealand as well as the Pacific islands and in a number of other countries during a career in soil science spanning almost 60 years. Wim's passing severs another of the few remaining linkages with the remarkable post-war generation of soil surveyors in New Zealand. As well as being an exceptional pedologist who contributed greatly to an understanding of soil resources, and soil science more widely, in New Zealand for five decades, Wim was a modest, decent, reliable and productive colleague, a fluent speaker of multiple languages, a sagacious friend and mentor, and generous and loving family man (Fig. 1).

Fig. 1*. Wim, relaxed and content, on an outing with his family in later life.*

Dutch heritage and early career

A younger brother of Hank, Wim was born in the Dutch town of De Bilt on the outskirts of Utrecht on 17 January 1936, and grew up in Biltohoven, also on the outskirts of Utrecht. He remained intensely loyal to The Netherlands and to his beloved Dutch language throughout his life despite also becoming a resolutely patriotic New Zealand citizen following his arrival here in the mid-1960s. He also spoke French and German. Wim occasionally used to quietly delight in surprising native speakers of these languages by unsuspectingly contributing to conversations in the correct tongue after a suitable period of 'uncomprehending' silence. Growing up in an occupied land during the war, narrowly escaping severe injury or worse in 1944 when an allied plane-delivered bomb intended for the nearby railway terminus ended up devastating the Biltohoven town square, landing about 10 m from where he was sheltering in the family home in which no window remained unbroken, Wim gained in self-sufficiency and independence, qualities that persisted through his life in all endeavours. Wim was to write later: "I tackle all sorts of home-handy man's problems confidently, telling myself, 'It's simple'. I tell myself: 'Go for it', and consequently some of our fences are not quite straight!" In this vein, one characteristically self-deprecating story told by Wim relates to his first effort at concreting. He decided to concrete the driveway of his newly-purchased Palmerston North home despite having no idea of the requirements. Just to be on

the safe side, he ended up laying concrete two-feet thick (i.e. ~60 cm), which Wim later described wryly as "more of a permanent monument than a driveway!" (The driveway is still there today, apparently.)
Wim was left-handed but was not allowed to write with his left hand at school and so had to learn to write with his right. He ended up ambidextrous, choosing to be left- or right-handed depending on whatever suited him best. After somewhat unexpectedly excelling in the end-of-school state exams, Wim studied initially for two years at the Agricultural School in Utrecht, where he was awarded a diploma, and then won a place, one of only 25 from ~300 applicants, at the College of Forestry and Rural Engineering (CFRE) at Arnhem, where he wrote a stand-out thesis on organic soils on peat in northeast Netherlands. Before this study, Wim underwent compulsory military training for 18 months driving tanks and half-tracks (associated weapons training resulted in partial deafness in his left ear). His work on peats led Wim to join a land redevelopment organisation called Nederlandsche.

Heidemaatschappij, which undertook wide-ranging work including soil science, especially on 'heathland' or 'moorland'. It was whilst Wim was playing billiards in a small pub in Friesland that one of his former lecturers of CFRE, then working for Nederlandsche Heidemaatschappij, walked in and offered him a job in Iran.

Wim's soil survey career took off from that point: he went to Iran (3 months in 1960), Egypt (based at Cairo 1961-62, undertaking tile drainage research in the Nile delta), the Congo (6 months, several phases), and Pakistan (two years based in Lahore for the World Bank, assessing salinity and alkalinity in soils, and training graduates in soil survey). After his marriage in The Netherlands in 1964 to New Zealander Sue Upton, whom he'd met whilst on a skiing holiday at Westendorf in Austria (a consolation trip for being left out of phase 2 of the Congo surveys), Wim realised, after another stint in Pakistan, then at the point of military conflict with India (which took place in 1965), that a more stable job would help ensure a stable family life. Consequently, he and Sue took the decision to move to New Zealand in 1966, sailing from Southampton appropriately on a ship called "Southern Cross".

New Zealand career

On arrival in Wellington, Wim initially met Harry Gibbs (chief pedologist) on the ship itself, Harry having negotiated customs and agricultural officers to get on board. In an article entitled "Pedological memoirs" (published in 2002 in "Jubilee Reminiscences", *NZ Society of Soil Science Occasional Publication* 3, pp. 93-94), Wim wrote that "Harry thrust at me for my immediate attention" copies of Soil Bureau bulletins numbers 5 ("Soils of North Island") and 26 ("Soils of New Zealand"). Having just met his mother-in-law for the first time, Wim went on to report that "Harry took us all to the top of Mount Victoria for a view of Wellington, where to my horror he and my mother-in-law got into a serious argument on the pros and cons of the Auckland versus Wellington climates. I thought my new job was on the line for sure!"

Bonded to DSIR for two years as recompense for the DSIR-funded boat fare he'd received, Wim was appointed to Soil Bureau on 21 April, 1966, and sent to Palmerston North, where he spent 5 years, to work with Des Cowie who was officer-in-charge. Wim's first job was a survey of Pohangina County. He wrote (in his 2002 article), "Des used to come out into the field with me once a month and we had some good times discussing soils together. He always carried a thermette and teatime was a great ceremonial occasion. We invariably ended up in the Ashhurst pub on the way home. These were the days of the 6 o'clock swill, so our visits were usually short".

Wim was especially proud of the Pohangina survey he undertook in those early days (Rijkse, W.C. 1977. Soils of Pohangina County, North Island, New Zealand. *NZ Soil Bureau Bulletin* 42). This was among the last of the county-based soil surveys to be published as a bulletin by Soil Bureau. In a letter to Phil Tonkin in 2007, Wim wrote:

> "I was lucky enough to have 2 years with Des Cowie whom I still regard as one of the best pedologists we ever had. Des went to Thailand for 2 years and I became district pedologist for the Manawatu and Hawke's Bay. When Des came back, I moved to Rotorua in 1971 where I had [forester] Graham Will's office [at FRI campus, Rotorua] for a year. Alan Pullar joined me after a year…till we had our own office which opened 27 September 1972."

The opening of the new office in Rotorua in 1972 was an important occasion with several bigwigs joining Wim and Alan, who had transferred from Whakatane to work in Rotorua, for the event (Fig. 2). Wim and Alan were joined by Neill Kennedy in 1974 (through to 1993). Alan, a keen field-man like

Wim, passed on many tips. One such tip (subsequently passed from Wim to one of the writers, David Lowe, and thence several generations of students) was, on arriving at a newly exposed roadside cutting of tephra beds and paleosols, to "look for friends". By this, Alan meant the first task was to identify one or more distinctive tephra marker beds known to the viewer and then the rest of the sequence would at least be decipherable stratigraphically to some degree. Alan, who retired in 1982, was also a strong believer in what he called 'hand-over-hand' mapping of tephras, meaning going from road cutting to road cutting following the tephra layers using their stratigraphic relationships, physical properties, and associated paleosol character to correlate them.

***Fig. 2**. All dressed up for the opening of the new soil survey office (DSIR) on the Forest Research Institute (FRI) campus, Rotorua, 27 September 1972. From left: soils people Mike Leamy, Alan Pullar, Ian Baumgart, Wim, and forester Harry Bunn.*

Wim noted that he frequently joined forces with Alan, the Tolaga Bay soil survey (*NZ Soil Survey Report* 40) providing a good example of an output from their combined efforts. Another point made by Wim, complete with a laconic smile, was that he had taken to proudly using what he called a 'ladies spade' (a small, light-weight spade, essentially) (Figs. 3 and 4) for much of his work on the usually friable Pumice and Allophanic Soils formed on easily-dug tephra deposits. He justified his usage by explaining that he was following in the 'no nonsense' footsteps of the redoubtable Alan Pullar.

***Fig. 3**. Wim at the Pureora buried forest northwest of Taupo (14 Feb 1984) complete with shorts, cap, and (in foreground) a 'ladies spade'. Photo D.J. Lowe*

Wim writing in 2002: "Those were the golden times of soil survey, when budgets, managers and endless paper work were unknown and we just got going and did the job. It was a great privilege to have worked with such fine people as Alan and Des. I was lucky."

From the mid-1970s to the early 1990s, Wim spent time away from New Zealand undertaking surveys in the Pacific and in Papua New Guinea. Wim's first foray into the Pacific was to join Gary Orbell and Mike Laffan for the 1: 25,000 scale soil survey of Vava'u (1976), the northern island in the Tonga group. Wim went to Fiji in 1981 where colleague Dave Leslie had been based (three years in total) undertaking the national soil survey and was soil correlator for soil surveys of the agricultural research stations. With Malcolm McLeod, Wim conducted detailed (1: 3,000) soil surveys of Sigatoka and Dobuilevu Agricultural Research Stations on Viti Levu. Soil taxonomic unit descriptions (STUDs) and soil survey reports were published for both surveys. Wim joined up again with Dave Leslie, and also Dave Giltrap, in Samoa in 1989 for an Asian Development Bank Land Resource Planning Project implemented in association with Auckland-based company ANZDEC. Malcolm McLeod joined Wim to complete the work. This project involved field survey of the land resources, establishment of GIS, the production of three 1: 50,000-scale thematic maps (soils, land use/land tenure, land capability), and local training in pedology.

Dave Leslie:

> "I remember the training workshops conducted by Wim about soil description, soil survey, aerial photo interpretation, and remote sensing. He was an excellent trainer. Wim at all times was unruffled, treated Pacific Islanders with respect and civility, showed great patience, and always wanting to share his knowledge. I was struck by his total commitment, energy, enthusiasm, and love for field work."

Next for Wim was surveying in the Highlands of Papua New Guinea (PNG) (1993-94). Landcare Research was contracted by CSIRO to provide inputs to the AusAID-funded PNG Resource Information System (PNGRIS) project. Wim teamed up with Les Basher and Bruce Trangmar and they conducted some innovative research. Their publications produced included a "Handbook for Land Resource Survey Methods in PNG"; "Land Suitability Assessments for Selected Crops in PNG"; "Land Resource Survey of the Upper Ramu Catchment", with an associated report dealing with database attributes for the survey; and another report describing soil-landscape models and soils of the eastern Highlands. At a subsequent seminar he presented for the Department of Earth Sciences at the University of Waikato, Wim's knowledge and evident pleasure in describing his time in PNG was topped off by his comment, "I love PNG". Basically, in that simple sentence, any country, county, or field mapping area could be substituted for 'PNG' as far as Wim was concerned!

As recounted by Malcolm McLeod in his eulogy at the funeral for Wim on 29 September 2017, it was no accident that Wim was chosen for those overseas postings: with limited time, limited resources, and limited support, the survey required a reliable pedologist who could do the job in the time available with no recourse for later re-investigation, and Wim was that 'go-to' pedologist. At the same time, Wim greatly appreciated the companionship of these trips as well as the local people, culture, and soils.

Wim's expert knowledge in the use of aerial photo interpretation, as noted already, was used to good effect in many parts of New Zealand, manly in North Island, including the Manawatu, Taupo-Rotorua area, and East Coast (North Island), and he was a key figure in the resource investigation in the King Country with Gary Orbell, Hugh Wilde, Dave Leslie, and numerous others that occurred during 1976 and 1977.

Dave Leslie:

> "We first worked together on the second phase of the King Country team soil survey. Wim was team leader for the phase [covering the area west and south-west of Lake Taupo] and, with his knowledge and ability to identify tephras – from working with tephra guru, Allan Pullar, in Rotorua office – was invaluable for all members of the team, many of whom were from South Island offices. We subsequently worked together on the Manukau City team soil survey."

At the demise of DSIR on 30 June 1992, one of the writers (David Lowe) delivered to Wim a compatriot from Wageningen University, A.G. 'Toine' Jongmans. Toine was working on a project involving the micromorphological study of an age-related sequence of soils formed on tephra in New Zealand (with Dutch student Lideweij 'Liddy' Bakker). Wim was to take Toine to see and sample the Taupo soil. David and Toine arrived at around 5 or 6 pm on 30 June to be greeted by Wim on the FRI campus standing next to a mock grave outside the soil survey office complete with a cross with the inscription "DSIR − RIP". Wim knew that the end of such an era in which he had played an integral part was profound. Nevertheless, Wim's son Mark wrote in his eulogy: "Despite frustrations with the way science was marginalised by successive governments in New Zealand and the increased management bureaucracy with which he and

his colleagues had to deal, he never lost his love of the land and that enhanced his love of New Zealand, which he got to see in the closest way".

Wim moved to the Hamilton office of Landcare Research in 1993, joining Malcolm McLeod and Peter Singleton on the Ruakura campus before the temporary shift to 'within' Waikato University and then to the current building on the university campus alongside the NIWA building eastward of Hillcrest Road. At this time Wim was living in Cambridge. He was greatly affected by the sudden death of his wife Sue in 1994. Wim was a quiet unassuming man and Sue was his perfect foil, being vivacious and outgoing. Together they made a great team.

Wim retired from Landcare Research in 2002 and started his own consultancy, 'Land Use Consultants', shifting to Mount Maunganui for his final years. He worked mainly with the Bay of Plenty Regional Council in sampling programmes and with S-map, eventually covering the entire Bay of Plenty region at a scale of 1: 50,000, a truly mammoth achievement. He collaborated with Dani Guinto on much of this work in later years, collating a number of seminal soil resource publications for the region with Dani (see Dani's comments below). Wim undertook a survey of the Bay Plenty eastward of Opotiki along the coast, a job Wim described as "more of a holiday than survey work!" He also taught students at a soil science course at *Te Whare Wananga o Awanuiarangi* in Whakatane for a degree in environmental studies.

A long-standing role from around 2000 was to work with Graham Sparling and others for the 500 Soils project on soil quality indicators, a project described by Wim (in another letter to Phil Tonkin in 2007) as a "good example of cooperation" between a CRI and 10 regional councils. Wim worked on various consultancies and for the Bay of Plenty Regional Council on contract right up until 2016, enjoying very much "being able to work by his own rules".

Helping students, mentoring colleagues, contributing selflessly

Wim was a great teacher and mentor, patient, calm, knowledgeable, and practical in all aspects of pedology, and sagacious and thoughtful on life matters in general. Some examples of his support and mentoring are described below.

Bill Cotching summarises his time spent with Wim as follows.

> "I was a fresh graduate in 1978 and started work in the Soil Bureau office under Wim's guidance. Wim was in charge of the office but I never felt that he was 'the boss' but rather that we were colleagues. I phoned before my arrival and asked what time should I turn up. His response was that the place was not run like a factory and there was a degree of professional freedom as a scientist. He was dedicated to the soil cause but relaxed in his approach to life."
>
> "Wim taught me a lot about how to conduct good field soil science or pedology. One needs to spend time in the field with no distractions so that one gets a 'feel' for the land. One needs to walk the country to know it by feeling it beneath your boots over many seasons. Wim told me that it takes five years in a district before one can become useful. Careful observation using as many senses as possible, meticulous record keeping, and collecting many profile descriptions to cover the range of soils that occur was how Wim did his soil science. Nothing flashy, just meticulous good science. He taught me the intricacies of constructing a soil map legend (the differences between a series, type, phase, variant, complex, and association), and how to use aerial and multispectral photography to aid soil mapping. Being Dutch, he always had a Dutch clay auger, and I won't go in the field without one [see Fig. 4]."
>
> "Wim's soil maps had a distinct style to them that I would describe as having 'rounded' polygons. I think he followed what Harry Gibbs said I should do and that is to use a thick crayon to draw soil maps. It is said that pedologists fall into one of either two camps: lumpers or splitters. Wim was definitely a lumper. Being a lumper meant that Wim was probably better attuned to 100,000 rather than 1: 20,000-scale mapping but I spent time with him mapping at a variety of scales. We collaborated mapping the Opotiki district at 1: 15,000 and Reporoa/Broadlands at 1: 50,000. We jointly surveyed several small islands in the Bay of plenty and travelled widely to describe soils in graveyards as these are likely little disturbed and were associated with nearby climate stations."

Fig. 4. *Soil Bureau group on a trip near Rotorua 1979. From left: Neill Kennedy, Alan Pullar, unknown, Graeme Claridge and son, and Wim. In front is Bill Cotching with omnipresent Dutch auger. Note the 'ladies spades' carried by Wim and Neill.*

Bill continues:

> "We often shared a motel room with no complaints about each other's habits. He did enjoy a coffee and smoking his pipe (Fig. 5). He and Sue entertained my wife Judy and me in their home on a number of occasions and showed by example what family life can and should be like. When conducting my own soil survey he regularly spent a day in the field with me to guide my mapping and allow him to get a feel for the soils. This allowed him to correlate work across the Bay of Plenty in later surveys."
>
> "Wim always encouraged me to learn and develop as a great mentor does and he pushed me to get involved in team surveys, undertake irrigation-related research, and publish my results. Soil Bureau had an ethos of publishing and I think that just became a part of all those who worked there. Being half Wim's age when I joined Soil Bureau meant that I was the one who had to ascend ladders to freshen up tall road cuttings and attach the tephra labels for conference field trips, and I bent the back to dig the occasional deep pit in Kaingaroa forest."

***Fig. 5**. Wim in contemplative mood amidst the soils of Northland, 1983. Photo P.L. Singelton*

Haydon Jones, who was undertaking his PhD thesis research with supervisor David Lowe (University of Waikato) on the heavy Ultic Soils of Northland near Warkworth, recalls that he was greatly helped by Wim's support and advice over multiple trips into the field area (Fig. 6). Haydon writes:

> "Wim generously gave his time and shared his vast knowledge and experience of soils, tephra, and life in general to assist those, such as myself, learning and working with soils. I very much appreciated the opportunity to learn from Wim and greatly enjoyed spending time in the field and talking with him."

***Fig. 6**. Wim (front) with Haydon Jones and Ultic Soils (background) in Northland, October 1999. Photo D.J. Lowe*

Similarly, Reece Hill, studying for a PhD at Lincoln University with supervisors Phil Tonkin and Peter Almond on the multilayered Allophanic and Pumice Soils of the Mamaku Plateau using a complex soillandscape modelling approach, wrote:

> "Wim's guidance as I commenced my PhD field work was a fantastic help. Following my PhD I spent several years working with Wim and establishing and sampling soil quality sites for the 500 Soils project and for the ongoing regional soil quality monitoring programme for Waikato Regional Council (WRC) (Fig. 7). Over this time Wim and I shared many days in the field together, I grew to

know Wim well, I enjoyed hearing of his previous work around the world in earlier days, planned visits to see family, and his dislike for office work. Wim was a great guy to be in the field with [and] talking soils, and a true gentleman".

Another colleague, Carin Burke, wrote, "Wim was a great guy – so full of energy and humour and generosity". Bob Lee: "He was a good colleague and friend and although we did not see each other that often since his retirement, I will miss him".

Finally, Dani Guinto writes:

> "I met Wim as our soil consultant back in 2008 when I was working for the Bay of Plenty Regional Council. Because soil scientists in New Zealand are now thin on the ground, I consider myself lucky since Wim, although semi-retired at that time, has generously shared his knowledge and passion about soils of this region. My association with him culminated in the publication of a 3-volume book called "Soils of the Bay of Plenty" which Wim describes simply as a book for lay people who want to learn about soils and how to manage them for production and environmental aspects. I am truly grateful to Wim for providing me with such hands-on training that when I go on-farm and dig a pit, I can tell the farmer not just the characteristics of his soil but more importantly how to improve or manage its health. I am thankful to Wim for those wonderful moments out in the field, climbing fences (or going under fences), digging pits, sampling soils, sharing his knowledge, his stories, giving me personal advice, or just having fun. He has been a very good friend and is certainly missed but his legacy lives on in my heart and mind."

***Fig. 7**. Getting down to it: Wim sampling for the soil quality sampling programme for WRC in the early 2000s. Photo R.B. Hill.*

Another role that Wim excelled at was leading or supporting field trips, especially for the New Zealand Society of Soil Science. He led a most interesting trip in 1992, when the society's conference in Rotorua was themed "Soils and Trees" (Fig. 8), taking participants through farm-forestry developments in the Lake Rototiti area through to the Allophanic Soils of Te Puke (where Bill Cotching showed off a classic soil profile) and finally Podzol Soils (Kairua series) on mid-Holocene dune sands at Papamoa, together with a quick look (courtesy of work by David Lowe's masterate student Glenn Wigley) at thin, mid-late Holocene tephra layers preserved in peaty swales between dune ridges in the same area.

***Fig. 8**. Distinctive illustration drawn by Wim for the front cover of the fieldtrip guide book for the NZSSS conference held in Rotorua in 1992.*

Wim's steadfastness and deep knowledge of the region's soils were to the fore at the next society conference to be held in Rotorua, in 2006, where he joined David Lowe, Loretta Garrett, Haydon Jones, and Peter Singleton to help lead an epic one-day trip "Land and Lakes" comprising a rather daunting group of about 150 soil scientists and students (three large bus loads) around the Rotorua and Lake Rerewhakaaitu areas (Figs. 9 and 10).

***Fig. 9.** Wim (far left) amongst friends (tephra beds and human) at Brett Road Holocene tephra-paleosol section at Lake Rerewhakaaitu (near Mt Tarawera) on 17 November 2006, a site visited 11 days later on the three-bus-load field trip for the national soils conference of NZSSS in Rotorua. Alongside Wim are (from left) Haydon Jones, Loretta Garrett, Will Esler, and David Lowe.*

***Fig. 10**. Wim as many will remember him: with cap, steadfast, calm, in control personally and professionally. This photo was taken at a Whakarewarewa soil profile site in Radio Hut Rd, Whakarewarewa Forest, just east of Wim's old soil survey office on the FRI (now Scion) campus in Rotorua, during the national soils conference field trip 28 November 2006. Scott Fraser just visible at left and Haydon Jones at right, Allan Hewitt prominent in background (with camera poised). Photo M.R. Balks.*

Wim also was a regular and welcome participant in the biennial, one-day Waikato-Bay of Plenty (WaiBOP) regional soil conferences held at University of Waikato since 2011, enjoying meeting old friends and colleagues as well as loyally supporting and encouraging students and the young, early career soil scientists (Fig. 11). A short tribute to commemorate Wim's very significant ~60-year-long contribution to soil science (but commensurate with Wim's innate modesty and dislike of fuss) is planned for the forthcoming Wai-BOP 2017 soils meeting, which is being held in Hamilton on World Soils Day, 5 December, this year.

Other interests, quirks, and family

Wim was rarely in long trousers, preferring shorts regardless of the weather, and he had a favourite cap that would be worn until extinction. In his shorts, writes son Mark, "would inevitably be two items that Wim carried habitually: a large red patterned handerchief of which he seemed to have an endless supply, and a pocket knife – Swiss Army of course. He was never ever without one". Wim would almost be determined to find a daily use for his knife, such as opening a beer or opening letters or birthday or Christmas presents and other parcels. As a teenager, Wim had enjoyed volleyball and water polo being accomplished and determinedly competitive at both. Although one would not consider him a sportsman, Wim enjoyed a range of sports and developed a life-long love of canoeing and sailing. He also took up cycling and gliding, the latter coincident with his move to the Mount. In Rotorua, Wim built a racing dinghy for Mark, and the Rotorua Yacht Club became an important part of life for Wim (and Mark) for many years, as did fly-fishing including in the Utuhina Stream at the end of the family's street in Rotorua.

***Fig. 11**. Always up-front: Wim (second row with pale blue top) supporting colleagues, students, and friends mainly from the Waikato-Bay of Plenty region at the Wai-BOP Soils meeting in Hamilton on 5 December, 2013. Photo D.J. Lowe*

Although travel overseas is easy these days, and Skype has been invented, Wim's migration to New Zealand in 1966 was a huge wrench for his mother, Anne (Wim's father, Hendrick, died when Wim was only 13). To help compensate for her loss, Wim wrote a long letter unfailingly every Sunday evening to Anne, frequently posting recorded messages (using a reel tape recorder) as well to help involve her in his family life in distant New Zealand.

Wim enjoyed being at Mount Maunganui and walking around and up the Mount (Mauo), reading, good coffee, kayacking in the harbour (also Ohiwa's), gliding, photography, bird life, and his favourite drinks including (harking back to his thesis days and Heidemaatschappij) peaty whisky from the Isle of Islay (Scotland). He cherished his family and in later years his grandchildren, relishing every opportunity with them.

Marrying his second wife Helen Main soon after his 70th birthday (2006), in recent years Wim began to travel annually to The Netherlands where he re-connected with friends and his Dutch family, could practice his Dutch and enjoy his Dutch heritage. He was shyly proud of the compliments he received that his Dutch had remained eloquent and perfectly accented despite having left his home country way back in the 1960s. He occasionally lapsed into Dutch whilst speaking to his family members in New Zealand, forgetting that they had not learnt the language!

Diagnosed with terminal illness in The Netherlands in August, Wim's reaction was, typically, one of calm stoicism and with concern for his family rather than himself: "I have lived a good life. I have done what I wanted to do. I have a family I love very much. I will be fine." He was torn between remaining in The Netherlands but equally determined to return to his second home, New Zealand, which he did. Wim's family has generously donated a selection of Wim's books, papers, and maps to the University of Waikato Library for the benefit of the coming generations.

Conclusion

Wim will be remembered by colleagues and friends both for his many personal attributes and wideranging experience and expertise in soil survey that traversed (literally and metaphorically) a very wide range of areas and landscapes in New Zealand and the Pacific, PNG, and elsewhere. His publication record is an impressive legacy, with many scientific papers, soil surveys, and land-use reports to his credit, testament to his hard work, discipline, and sound training after a character-building childhood and multifarious early soil science career based in The Netherlands, followed by the transformational migration to New Zealand when he was just 30 years old. Wim is survived by his second wife Helen and his two children, Mark and Emma and their spouses, and five grandchildren.

Acknowledgements

We especially thank Mark and Emma for providing much of the material, including deeply personal memories, as a basis for this article, and Helen Main for her warm support and assistance handling Wim's library collection. Colleagues who wrote personal tributes or provided photographs are also thanked. Esther Peerlings kindly helped with a little piece of Dutch etymology.

5th National Australian Soil Judging Competition; Toowoomba, Australia 2017

Our adventure started bright and early Sunday morning, the nine of us piling into a shuttle to the airport, bleary eyed and still half asleep. The 2017 5th Australian Soil Judging Competition awaited us in Toowoomba, Queensland.

Image 1: *From Left: Sephrah Rayner, Connor Edwards, Alvand Azimi, Josh Nelson, Verina Telling, Judith van Djik, Milan Bonkovich, Irene Setiawan. Absent from photo: Camilla Gardiner (but still a key team member).*

Off to Toowoomba we went. After settling into our accommodation we explored the local sites. Toowoomba the “Garden City” and had just finished its Carnival of flowers, giving us the opportunity to smell a few roses before we got into the depths of soil judging.



Images 2, 3 and 4*: Exploring the Toowoomba Botanical Gardens with the Kiwi Soil Judgers, settling in to Toowoomba.*

Soil Judging Practice. Now this is what you want to get into, if you have even a slight inkling of interest in soils you’d be addicted after seeing these practice pits. What beautiful soils! A broad range, contrasting in colour and conformation. They maybe not as varied in texture (clay everywhere) but if you’re used to New Zealand soils they sure are different!

Image 5: Alvand contemplating a buried Sodosol with his Niwashi.

We had a great bunch of knowledgeable Australian Soilys to take us through the practice soil pits. Finding and preparing seven soil pits in contrasting landscapes, sharing their expertise and time with us was greatly appreciated and very interesting. It definitely ‘expanded our horizons’.

Image 6: Jim Payne sharing his soils wisdom with the Kiwi crew.

Day one, we jumped on a bus and went east back down the Great Dividing Range (700m altitude) to Gatton to look at four different soil pits. Two clay rich soils, one Vertosol and one Dermosol, dark and prismatic. One Chromosol with rich red mottles at depth and the other a Sodosol, with a pale eluviated horizon that was buried under a gravelly red-orange fill that just made it 'pop' (image above). As well as this we heard from one of the local Ag Forestry and Fisheries Researchers, Steve Harper. With years of experience of the local area he talked about its history in market gardens, producing the majority of potatoes and other vegetables for all of Queensland.

Image 7: *The complete Kiwi crew; Two teams of 4 and a team leader. From top left: Josh, Milan, Irene, Connor, Judith. From bottom left: Sephrah, Alvand, Camilla and Verina.*

Images 8-14*: Australian Landscape*

Day two, jumping on another bus we headed in the opposite direction. Off west to Darling Downs, with a pit in Toowoomba, Kingsthorpe and Jondaryan into the 'erosional landscapes of the basaltic uplands'. The weathering status and hardness of Basalt determine many of the soil patterns in the landscape. Driving past paddocks with sodicity issues have cotton turned through them and left to fallow, 'pasture' paddocks with a few cattle here and there, bright green paddocks of barley and wheat providing a stark contrast to the surrounding vegetation.

Image 15: *Everyone crowded around the texturing trays, ready to get their hands dirty at the Ferrosol soil pit.*

Our first pit of the day was red. A Ferrosol that turns your hands red when texturing, providing a great instant tan for your legs or semi-permanent paint to graffiti your mates t-shirt. For the second we got treated to the most impressive slicken sides you've ever seen. Up until this point we Kiwi's had a rough idea what they were, having read about them, but seeing them in person was next level. Lenticular peds, which have a horizonal lens shaped structure that when pulled out of the pit face revealed the polished slicken side faces. The third soil of the day was a Calcarosol, using acid to test for calcareous material.

Image 16: *Getting the clay rich texture samples ready was a workout. Smashing them with a geo-pick in the hot sun.*

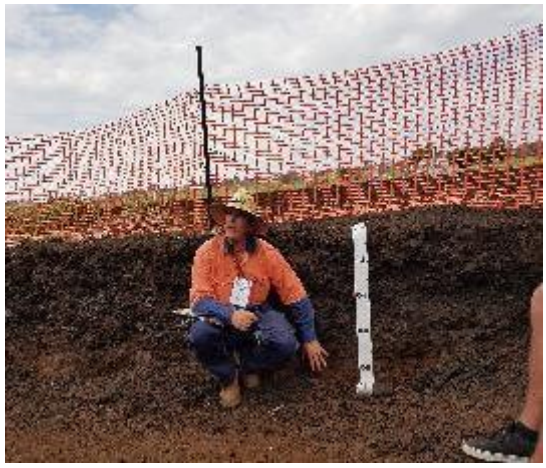


Image 17*: Andrew Biggs teaching us all about Vertosols.*

Image 18*: Lenticular peds and slicken sides*.

Image 19*: The Gilgai exposed!*

At the fourth pit we found ourselves staring at a thing of beauty, the soil pit had been dug to reveal the perfect finger of calcareous material that protrudes between Gilgai! Gilgai was also something that us Kiwis were trying to wrap our heads around. A Gilgai is a small, temporary lake formed from a depression in the soil surface in expanding clay soils. Additionally, the term "gilgai" is used to refer to the overall micro-relief in such areas, consisting of mounds and depressions, not just the lakes themselves. The name comes from an Aboriginal word meaning small water hole.

The practice days were long and hot, but comprehensive and helpful. Especially when it came to coming to terms with a whole new classification system and defining textures with more than 35% clay. Its one thing to read a book and practice in a lab, or on New Zealand soils, but Australia is a whole different ball game. A great experience all round.

Competition day started out like any other, up at 6am, breakfast, coffee, coffee, coffee and then all tumble into the van. By the time we got to the meeting point on the University Campus in Toowoomba we were all pretty much awake. Awake enough to take a few pre-competition selfies! The teams were looking pretty snazzy in their green competition shirts, with the "Bedrockers" and "50 Shades of Greywacke" printed across the back.

***Image 20**: Both teams. From top left: Connor Edwards, Milan Bonkovich, Camilla Gardiner, Sephrah Rayner. Irene Setiawan, Verina Telling, Josh Nelson and Alvand Azimi.*

"Soil judging has a long and distinguished history in North America; first initiated in 1961 and held annually at a different host institution each year. In North America, soil judging is taken very seriously and is seen as a key component of the soil science curriculum and an important part of the graduate attributes of all soil science graduates. There is stiff competition to be selected into the soil judging team, and team members train weekly during the competition season.

But what exactly IS soil judging and why should we care about it here in New Zealand? There is certainly more to soil judging than just "pedology by stealth". We would all agree it is advantageous for every soil science graduate to be able to describe a soil at a basic level and from this, to make some interpretations therein: whether for land use, fertiliser recommendations, nutrient fluxes, irrigation scheduling or waste disposal."

***Image 21:** Thanks to our sponsors that made the whole thing a reality; FAR, Landcare Research, Ravensdown, NZ Society of Soil Science, Centre for Soil and Environmental Research, LRS and Lincoln University.*

Competition Day of the 5th National Australian Soil Judging Competition, all teams were loaded onto a bus and taken to an undisclosed location. Two soil pits for the teams and one for the individual competition. The bus ride there was surprisingly quiet, the soil puns and witty comments of the last few days weren't forth-coming. Everyone was preparing mentally for the challenge ahead.

Biggsy gave us a run down of the day and we were put into groups to rotate around the three pits. The day was windy but the sun was out, soon becoming a scorcher and giving the water spray bottles another purpose; they make great face misters.

***Image 22**: All the teams lined up before the competition kicked off. 65 competitors and coaches in total, with 12 teams representing 10 Universities across Australia and New Zealand!*

First rotation of the day, Team "50 Shades of Greywacke" started at the individual pit where Josh Nelson, Verina Telling and Irene Setiawan competed, while team "Bedrockers" were at Pit #2 of the team soil pits.

The clock started and the countdown was on, 90 minutes to complete a full soil description. Thanks to the practice over the last few months and especially the two practice days, we felt confident with completing the description within the allocated time. Teams swapped, 5 minutes in, 5 minutes out for the first 20 minutes, then 10 minutes in 10 minutes out, with the last 30 minutes being free entry for any team.

***Image 23**: Team "50 Shades of Greywacke" in Competition Pit #2.*

Bedrockers were out for the first 5 minutes so the focus was on the surrounding land-forms, slope and surface condition and coarse fragments. A bit of entertainment was provided by one of the boys as he was looking at the soil surface condition surrounding the pit, promptly running back over to the tent after jumping a couple of foot into the air when he came across something rustling in the grass.

For the first 5 minutes in the soil pit, the focus was on defining horizons and boundaries so that the team "texturers" could get the samples to work into a good texturing bolus. Over the last two days we had been working hard to calibrate our fingers to the high clay content soil textures of Australian soils, lucky to find anything with less than 30% clay.

After filling out all the components of the score-sheet with 20 minutes to spare, we all descended into the soil pit to discuss all the aspects of our description, to confirm as a team that we were happy with our decisions. Thumbs up all round and we were ready for the next challenge.

Something that was noted by all throughout the day was how much we had learnt over the last couple of practice days. Hands on exposure to new exciting Australian soils and how much they contrast to New Zealand. The knowledge we gained from the very helpful and encouraging organisers was absolutely priceless.

The individual competition was structured much the same as the team pits but all the components of the description were completed by one person. Sorting out our gear we jumped straight into it, juggling books, geo-picks, texturing bolus and petri dishes of dispersing samples, the 90 minutes flew by! I don't understanding how timing 5 minute and then 10 minute intervals makes 90 minutes seem so short!

Meanwhile "50 Shades of Greywacke" were completing their first team pit, with both teams off to complete their 2 and final team pit after lunch. Lunch break could have been a competition in itself, "how many people can you fit under 2 gazebos?". Apparently competition day was the hottest day in September on record since the 1930s and we were definitely feeling it.

***Image 25**: "50 Shades of Greywacke" hard at work describing the soil profile.*

The final pit of the day was the most challenging as everyone was getting hot and tired by this stage. There was going to be a group discussion of the pits at the end of the day but due to the temperature this was called off and we all happily climbed back onto the air-conditioned bus to head back to Toowoomba. What a day.
Prize giving was held that evening, where everyone got to enjoy a well-deserved cold beverage or two. While the New Zealand teams didn't place in the team competition we did in the Individual competition! Camilla Gardiner taking out 1st place! Josh Nelson getting 3rd and Verina Telling getting 4th (6th in the ranking, but next after 3rd is 4th place still right?!)! Well done!

***Image 26**: Camilla Gardiner receiving her prizes for coming first in the Individual Soil Judging Competition*

***Image 27**: Team "50 Shades of Greywacke" receiving their prizes for coming first out of the NZ*

Congratulations to everyone who competed this year!

As noted at the NZ competition last year by Chris Baxter of University Wisconsin-Platteville that in his experience, *these soil judging competitions do encourage students into the discipline: the tactile and investigative side of soil judging is something that many students can excel in and the competition aspect makes it a fun activity. It engages their curiosity to learn more about soils, and it is a powerful recruiter to University soils courses and degree programmes.*

We look forward to the next one! and what a line up there is! Next year there's not just one, but potentially three competitions! The first in Brazil at the International Congress in Rio, then hopefully one in New Zealand at the New Zealand Soil Science Conference then one in Canberra, Australia!

Comradery, companionship and competition! the perfect combination, all that and 'expanding your horizons' with great soils knowledge. Soil Judging is indeed the new NBA! Expand your horizons, dig deeper!

Soil judging isn't yet as widely known as it should be, but we're on our way to making it the well-known sport. It's not only a challenging competition but a valuable skill and something to inspire enthusiasm in all. A shout out to all the people that made the competition possible, preparing such great practice pits and generously sharing your time, energy and knowledge. Also thanks once again to our sponsors who made this possible. New Zealand Sponsors were: FAR, Landcare Research, Ravensdown, NZ Society of Soil Science, Centre for Soil and Environmental Research, LRS and Lincoln University.

Links to the blog Articles:
https://earthwordsblog.com/2017/10/05/part-1-the-soil-judgers-of-oz/
https://earthwordsblog.com/2017/10/08/part-2-the-soil-judges-of-oz-competition-day/
Instagram: https://www.instagram.com/earthwordsblog/
Facebook: https://www.facebook.com/earthwordsblog/

Norman Taylor Lecture

Each year a recipient is chosen by the President of the **New Zealand Society of Soil Science** to present….

"The Norman Taylor Memorial Lecture"

Norman Taylor has been described as a keen philosopher who provided skilled leadership and a person who had a great ability to inspire others. In 1952, he founded the New Zealand Society of Soil Science and he served twice as its President. He was later elected as the first honorary member. In 1955, he was also a foundation member of the NZ Institute of Agricultural Science and was later elected a fellow. Through these actions and through the occurrence of the annual Norman Taylor Memorial lectures, Taylor continues to exert his influence upon soil science in New Zealand even today…

This year's lecture will be presented by **Professor Tim Clough** and is entitled:

"Developing integrated approaches to nitrogen management: defining soil's role"

Tim will present his lecture at **3 different locations** as follows…

Tuesday 5th December– University of Waikato, Hamilton
Time: 4 pm
Venue: Room MSB1.05, University of Waikato
Waikato Management School, accessed via Hillcrest Rd or Silverdale
To be proceeded by refreshments between 3.30-4pm as part of the WaiBOP Soils conference.
Contact: Prof David Lowe d.lowe@waikato.ac.nz

Monday 11th December – Lincoln University
Time: 3 pm - firstly for afternoon tea, followed by the Lecture.
Venue: Commerce 1 Lecture Theatre
Contact: Roger McLenaghen - roger.mclenaghen@lincoln.ac.nz

Wednesday 7th February - Massey University, Palmerston North
Time: 5.15 pm
Venue: AH1 Lecture Theatre. Refreshments (supper) will be served after the lecture
Contact: Mike Hedley - M.Hedley@massey.ac.nz
This event will follow day one of the annual FLRC workshop.

Background on Professor Tim Clough

While working as a soil scientist within AgResearch Tim undertook his PhD examining the fate of nitrogen (N) on peat soils. This led to further study of soil N transformations and an ongoing addiction with stable isotope tools to understand biogeochemical cycles in the environment. Tim then took up a Marsden Fellowship at Lincoln University looking at the enigma of ^{15}N balances in soils following ^{15}N tracer application, and ultimately demonstrated why ^{15}N recoveries are often incomplete due to previously unaccounted for loss pathways. Following further isotope training in Belfast, with the Department of Agriculture, Northern Ireland, Tim pursued further collaboration and study with experts at the University of California Davis while on a Fulbright Senior Scholarship. Subsequent research, aligned with his PhD students and collaborators, has focused heavily on understanding both the magnitude and the processes responsible for greenhouse gas losses from both pasture soils. More recently Tim's research has sought to manipulate and combine measures of soil microbiology, chemistry and soil physical conditions to understand and establish mitigation solutions to nutrient loss and greenhouse gas emissions The ongoing body of research generated has resulted in >100 peer reviewed papers and book chapters. Tim has served in various editorial roles for leading international journals (Soil Science Society of America, Journal of Environmental Quality) and currently serves as the Senior Editor for the Royal Society of New Zealand's publication 'New Zealand Journal of Agricultural Research', and as a Chief Editor for 'Soil Biology and Biochemistry'.

Tim's Norman Taylor address '**Developing integrated approaches to nitrogen management: defining soil's role'** will look at the nitrogen cycle within the grazed pasture system and discuss how soil type influences N cycling and N losses from managed pastures and what the potential management or mitigation solutions might be to address these losses, while highlighting possible areas of future research.

Please come along to hear Tim's lecture at one of these venues – all are cordially invited to attend…

News from the Regions

Waikato/Bay of Plenty

Landcare Research

A new digital soil map (DSM) for Franklin district has been completed, which will replace Gary Orbell's "part-Franklin County" legacy map currently in S-map. The mapping focused on soils of the South Auckland volcanic field (and adjacent land) and the Manukau Harbour. This map is the culmination of work since 2013 to develop DSM methodology and was jointly funded by Waikato Regional Council and Auckland Council. David Palmer, Peter Singleton, Reece Hill, Doug Hicks, Sharn Hainsworth, Robbie Price, James Barringer, Jarrod Hall and **Scott Fraser** all contributed to this work.

Photo 1: Putumahoe clay mapped as part of the Franklin digital soil map (Photo courtesy of Scott Fraser).

In June and August a team from Manaaki Whenua - Landcare Research sampled soils from 30 adjacent irrigated and unirrigated pastures in Hawkes Bay, Wairarapa and Central Otago. The sampling was primarily for a Sustainable Land Management and Climate Change (SLMACC) project investigating the impact of irrigation on soil organic matter (led by **Paul Mudge**). The sampling team included **Jack Pronger**, **Scott Fraser**, **Andre Eger**, **Paul Mudge**, **Thomas Caspari** and **Danny Thornburrow**. Soil samples from paired sites where there had been long-term irrigation will also be analysed as part of a MBIE project on "Soil Health and Resilience" (led by **Bryan Stevenson**) which is investigating whether soil properties such as clay mineralogy, thought to be stable over human lifespans, can be altered by intensive management. In an aligned project, University of Waikato MSc student Jamie Millar has sampled Pumice Soils around Reporoa in the Central North Island. During the June sampling in Hawkes Bay and Wairarapa, it was pretty cold and we had a mixture of sun, drizzle and gale force winds. Therefore there was some trepidation about heading to Central Otago in August! However, it turned out we struck a week of almost perfect weather. Soil sampling has now started in Canterbury where there is some alignment with a Sustainable Farming Fund project led by **Sam Carrick**, which is primarily investigating whether irrigation affects soil water holding capacity.

Photo 2: *Snowy mountains and cold weather in June (Photo courtesy of Thomas Caspari).*

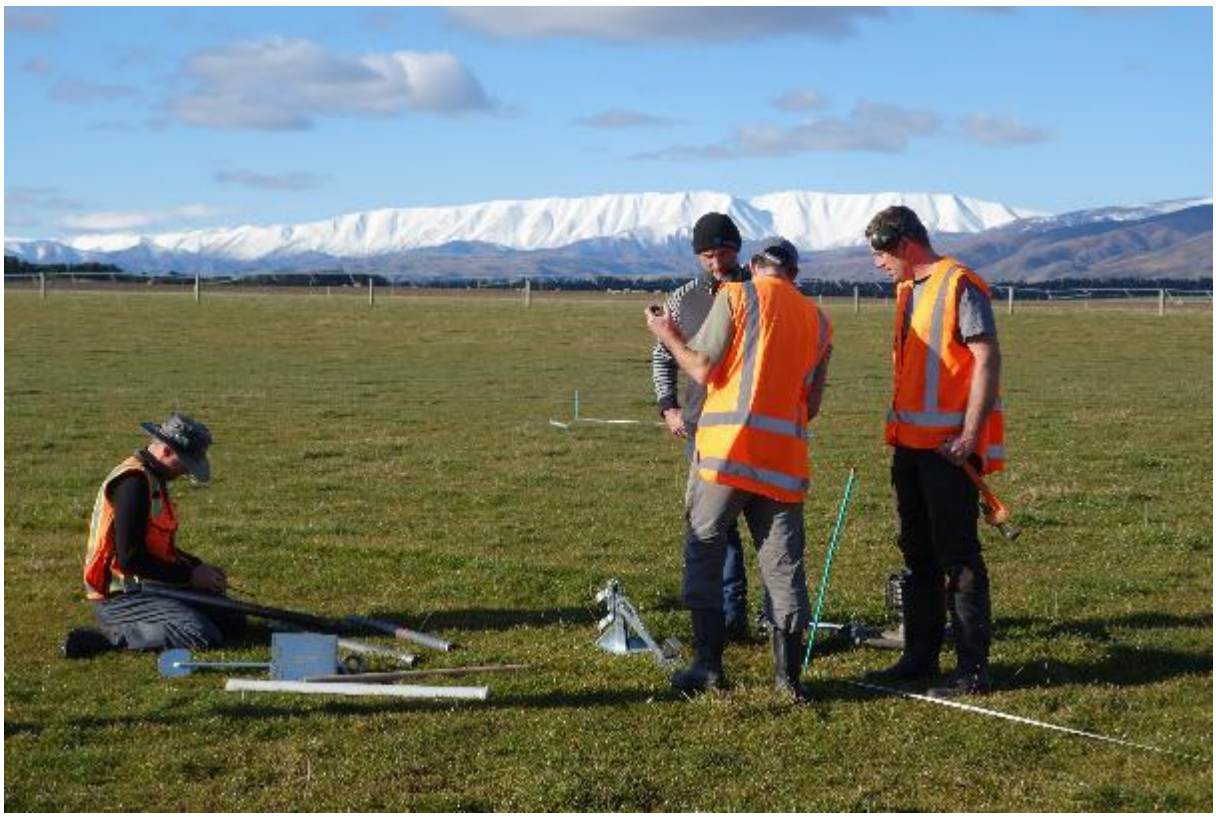


***Photo 3**: Jack, Paul, Scott, and Danny hard at work collecting cores (Photo courtesy of Thomas Caspari).*

***Photo 4**: Andre describing a soil (Photo courtesy of Thomas Caspari).*

***Photos 5 and 6**: Some of the cores collected, Pallic soil from the Wairarapa on the left and a Semi-arid soil from central Otago on the right (Photos courtesy of Paul Mudge).*

AgResearch, Ruakura

Stewart Ledgard had yet another 3-day visit to Rome as part of his co-chair role on a Technical Advisory Group on Nutrient flows and Environmental Impact Assessment of Livestock Supply Chains. At the Annual meeting he gave a key-note presentation on the work by the FAO Livestock Environmental Assessment and Performance (LEAP) partnership over the last five years. He has also been actively involved in finalising the draft of the methods for open review. Stewart also attended the 3rd Latin American Greenhouse Gas Conference in Colonia in Uruguay where he gave an invited talk on carbon footprinting of livestock products. There is a large focus in Latin America on systems for reducing GHG emissions and particularly on building soil carbon. Stewart also gave a talk at the NZ Grassland Association Conference in Wanganui about environmental implications of dairy systems with increasing use of brought-in feeds.

A workshop on mitigation of non-point-source pollution was jointly organised by the Chinese Academy of Agricultural Sciences and the New Zealand – China Water Research Centre. More than 40 Chinese scientists, researchers, students, industry personnel and government officials attended the workshop. The NZ delegation (**Prof Di** of Lincoln University, **Drs Luo** and **Laurenson** of AgResearch, and **Dr Miller** of Lincoln Agritech) presented and discussed the research being done in NZ in the water and environmental area with the workshop participants.

Photo above: Workshop participants – Dali, Yunnan Province, China

Introduction of NZ- China Water Research Centre

Introduction to plan for regional animal manure treatment and reuse

Photo above: Group discussion on non-point-source pollution prevention

In September **Gina Lucci** travelled with her colleagues **Eliecer Lopez** (IRTA Catalonia) and **Veronica Musselli** (INIA Uruguay) (Pictured right) to Brussels to visit the Directorate-General for Research and Innovation and the Directorate-General for Agriculture and Rural Development. Together they presented the newly formed research partnership between AgResearch, INIA (Uruguay), Teagasc (Ireland) and IRTA (~~Spain~~ Catalonia) to promote pastoral research. While there she also visited the Uruguayan Embassy and New Zealand Mission to the EU, and took the opportunity to vote in the NZ elections.

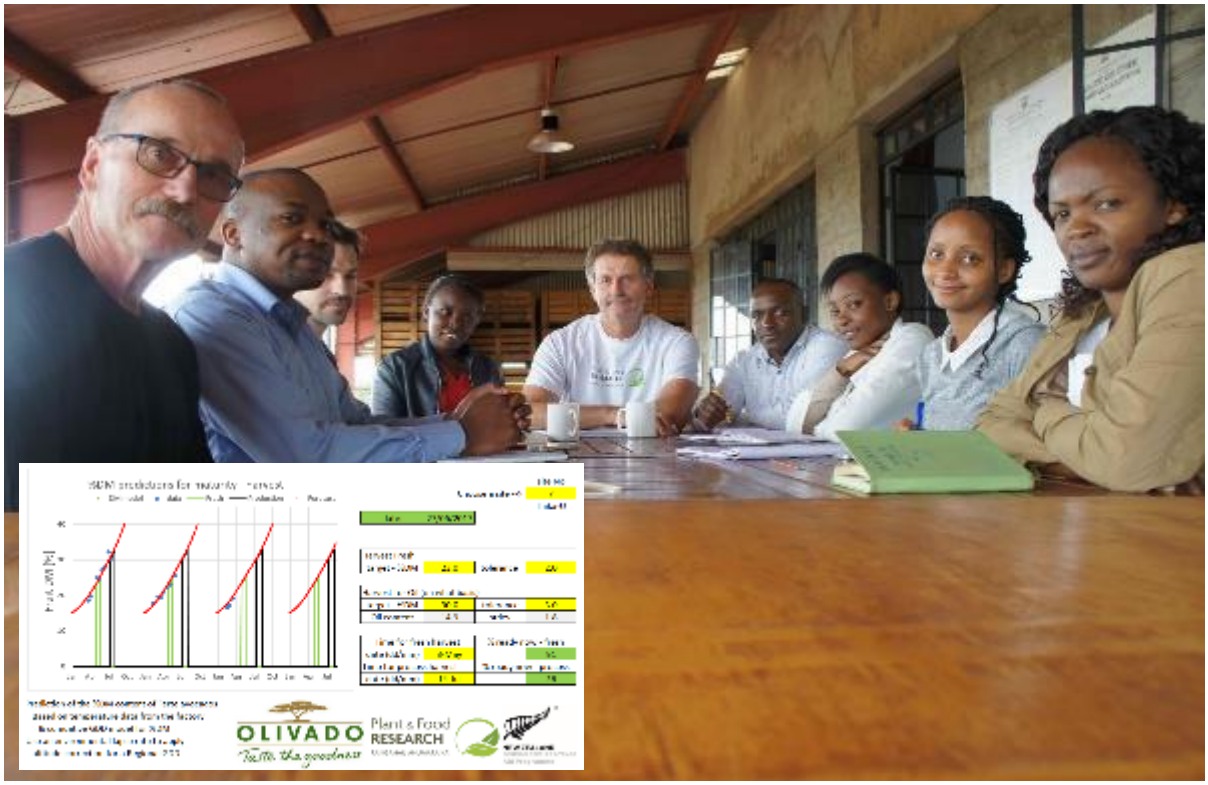
Dave Houlbrooke, **Diana Selbie** and **Moira Dexter** together with **Paul Johnstone** and **Jo Sharpe** from Plant and Food held an industry workshop in Hamilton in November to provide an update of research finding from their Forages for Reduced Nitrate Leaching (FRNL) project looking at quantifying the N supply from mineralised dairy effluent sources applied to land. The workshop was attended by representatives from DairyNZ, Fonterra, Ballance, Ravensdown, FAR, Eurofins, Hill Laboratories and ARL. The key aim of the workshop was to consult with industry to get feedback on their recommendations for the nature and complexity of a farmer tool to guide effluent management and fertiliser decisions associated with the application of different dairy effluent products to grow crops in a closed loop nutrient management approach.

The SFF project on sustainable nutrient management on Waikato peat soils has received an additional year of funding from MPI and co-funders (DairyNZ, Ballance and WRC). The extension will allow for a second drainage season (2018) to be monitored in the lysimeter experiment designed to assess the risk of FDE applications, guide scheduling and storage criteria and quantify losses of N, P and E. Coli. This work is in addition to other objectives monitoring surface water quality in drains, pasture response to N in soils of different development status and the development of a characterisation tool for peat soils and guidance with regards to dairy effluent management. The project is led by Gina Lucci and Dave Houlbrooke from AgResearch and also includes **Scott Fraser** (Landcare) **Peter Singleton** (Natural Knowledge), **Bill Carlson**, **Amanda Judge**, **Mike Sprosen** (AgResearch), **Bala Tikkisetty** & **Justin Wyatt** (WRC) and **Murray Lane** (Ballance) along with a bunch of motivated farmers.

Manawatu

Plant & Food

Brent Clothier and **Steve Green** have just returned from Kenya where they were working on Plant & Food's aid project in the Central Highlands of Kenya. The focus of this trip was to make operational the Decision Support Tool (DST) they have developed. There are two components to the DST. One is focussed on the 1,700 small holder farmers who supply avocados to the company Olivado for both fresh market and for processing for oil. This DST component will supply advice and guidance to growers by regular SMS texting that will use up-to-date weather information. The other component will be a Time-to-Harvest (TTH) DST that will be PC-based and used by Olivado to schedule the picking of fruit, both for fresh and processing, for all of the 1,700 farms across the diverse geography of the Highlands. Here is a photo of the 'start-of-visit' plannning meeting with Olivado staff, and an inset of the working-version of the front-end of the TTH DST.



Massey University, Soil and Earth Sciences

Ranvir Singh recently visited the Universidad de Chile in Santiago as part of ongoing initiatives to explore collaborative research and teaching opportunities in the area of soil and water management with Dr Osvaldo Salazar in his research projects on soil and water management issues. There Ranvir delivered lectures on advance concepts, methods and tools for water management to this year's "*Topicos en Manejo de Aguas'* course and provided feedback on the student's presentation of their case study assignments.

In his previous year's visit Ranvir facilitated a collaboration between environmental advisor of a European Food Retailer, Local (Chilean) Wine Company and Dr Salazar's research team at UdeChile to fund two master student research projects. This project is now well underway and Ranvir is co-supervising two master student research projects to assess current practices and identify scope for improvement of water and nutrient management practices in local vineyards. During this visit Ranvir met and discussed with the student's their research work progress, participated in their research proposal presentations, and visited their field experimental site to discuss set-up of irrigation and fertility trails at a vineyard in Maule region of Central Chile. Ranvir also visited and discussed with Dr Salazar progress on his research project on 'effects of inorganic nitrogen fertilization and cover crops on maize production and nitrogen leaching in a coarse-textured soil'.

Ranvir Singh with happy students after long hours of lectures on 'Topicos en Manejo de Aguas' at the Facultad de Cs. Agronómicas, Universidad de Chile, Santiago (Chile).

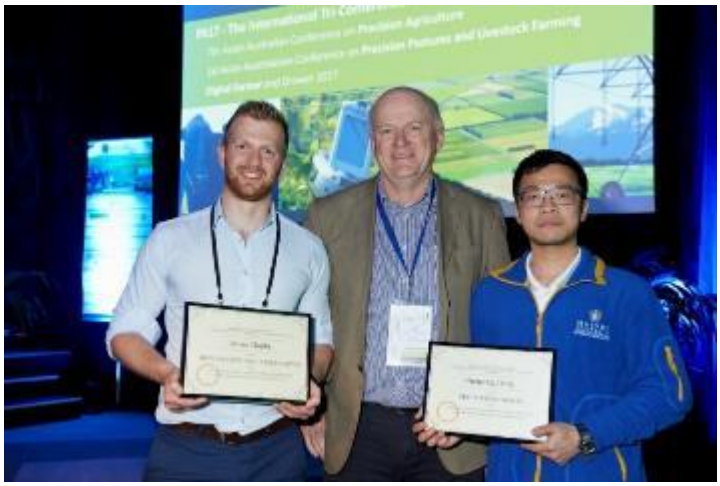
Ranvir Singh visiting and participating in soil sampling for setting up an irrigation and fertility trial at a vineyard in Maule Region, Central Chile

Roberto Calvelo Pereira from the Soil and Earth Sciences Group attended the 6th International Symposium on Soil Organic Matter held at Rothamsted Research, Harpenden, UK (http://www.som2017.org/; 3-7 September). At the Symposium, Roberto made an oral presentation about on-going research work on soil C enhancement in grazed pastures through infrequent deep ploughing.

Professor Ian Yule and the New Zealand Centre for Precision Agriculture at Massey University, hosted a group of 19 delegates from Malaysia on a tour of New Zealand looking at Precision Agriculture in practice. The tour was organized with Space Exploration Asia, and included 13 field visits to: Massey University (Palmerston North); Waitatapia (Bulls); Scion (Rotorua); Gallaghers (Hamilton); Zespri & GPS-it (Tauranga); A C Wilcox & Sons, Autogrow & Yamaha Sky New Zealand (Auckland); Greenvale Pastures (Methven); Riverholme Pastures (Pleasant Point); Eric and Maxine Watson (Ashburton) and; Ravensdown (Christchurch). The group were looking for ways to bring about change in the areas of Agritech and Agribusiness in their own country, and look for collaborations between eachother and New Zealand.

Ian Yule with the Malaysian delegation

The New Zealand Centre for Precision Agriculture had two PhD students take out awards at the International Tri-Conference for Precision Agriculture which was held in Hamilton 16th – 18th October. Istvan Hajdu took the award for "Best Student Oral Presentation" and Gorden Jiang for "Best Student Poster".



Ian Yule with Istvan Hajdu (left) and Gorden Jiang

Associate Professor Chris Anderson from the Institute of Agriculture and Environment has a long-standing research collaboration with the Institute of Geochemistry of the Chinese Academy of Sciences in Guiyang, China, that has since developed into a significant partnership that has seen Chris supervise a significant number of graduate students in China. Chris has been rewarded with numerous high quality research publications. Chris and his primary Chinese colleague applied for the Guizhou Provincial Government Science and Technology Collaboration Award to recognise the success and enduring nature of their work together. They were successful and Chris travelled to China recently to receive the award.

Recent PhD completions in Soil Science at Massey University include:

- Jane Chrystal, “Dairy wintering systems in Southland, New Zealand - Quantification and modelling of nutrient transfers and losses from contrasting wintering systems”. Jane was supervised by Professor Mike Hedley.
- Sue Chok, “Improving Granular Fertiliser Aerial Appication for Hill Country Farming” Sue has been supervised by Prof. Ian Yule and Dr Miles Grafton and her work has greatly contributed to the “Variable Rate Application Technology” project with the New Zealand Centre for Precision Agriculture.
- Aaron Stafford, “Distribution of Cadmium in long-term dairy soils, its accumulation in selected plant species, and the implications for selected management and mitigation options”. Aaron was supervised by A/Prof Chris Anderson.

Canterbury

Lincoln University

It has been a busy spring with several new postgrads arriving in the Department. **Phuong Van Nguyen** has arrived from Vietnam, his PhD research will investigate the nature and dynamics of organic phosphorus in soil-plant systems. His supervisors are Leo Condron and Richard McDowell. His scholarship is supported by the Vietnamese Ministry of Agriculture and Rural Development.

Marion des Roseaux is working on soil microbiology supervised by Tim Clough, Leo Condron and Maureen O’Callaghan (AgR). **Parsa Mohajeri** working on wastewater treatment supervised by Carol Smith, Henry Chau and Nik Lehto. **Kirsten Deuss** working on Soil hydraulic properties supervised by Peter Almond, Carol Smith, Sam Carrick and Clint Rissman (UC).

Four new PhD students recently arrived from Morocco. They are **Mohamad Bayad, Mousa Bouray, Meryem Drief** and **Driss Touhami**. All students will be researching aspects of phosphorus cycling and are supervised by Leo Condron, Jim Moir, Rich McDowell, Henry Chau, Nik Lehto, Stephen Trolove (PFR) and Colin Gray (AgR) and Laura Villamizar (AgR). **Andrea Leptin** has joined us for a three year MBIE funded PhD student. She is supervised by Nik Lehto, Keith Cameron and David Whitehead (Landcare).Her research will involve looking at carbon and nitrogen cycling in plant rhizospheres.

Camille Rousset is supervised by Tim Clough working on a GPLER project “Mitigating N_2O by optimising irrigation”. We have also had several postgrads successfully defend their theses: **Monica Giona Bucci** “ Lessons learned from liquefaction of the Canterbury Earthquake Sequence (2010-2011) to inform paleoliquefaction studies”. Monica’s supervisors were Peter Almond, Carol Smith, Pilar Villamor of GNS and Tish Tuttle (USA-based). **Shamim AlMamun,** his thesis entitled "Carbonaceous soil amendments to reduce plant Cd-uptake in NZ’s agricultural systems". Shamim was supervised by Brett Robinson, Nik Lehto and Jo Cavanagh (Landcare Research). And last but not least, **Gustavo Boitt** his thesis entitled “Phosphorus legacy: role of long-term soil phosphorus accumulation in the sustainable management of intensive agroecosystems. Gustavo’s supervisors were Leo Condron, Steve Wakelin (SCION) and Amanda Black.

Visitors: **Chamindu Depgoda** from University of Peradeniya, Sri Lanka on LEARN scholarship for 6 months working withTim Clough on soil physics and GHG emissions.

We also have our summer scholarship students who started work in the Department for 10 weeks over the summer. **Tessa Schmidt** (working with Jim Moir) is researching High Country soil fertility issues; **Maui Duley** (Henry Chau, Eirian Jones and Carol Smith) is working on a meadow mushroom project “Are you a fun-guy or fun-gal?”; **Portia Crabtree** and **Jack Dixon** are both working with Nik Lehto on “The role of redox conditions in informing trace-element bioavailability in freshwaters” (Portia) and “Organic amendments for managing trace metal bioavailability in NZ soils and fresh waters” (Jack).

A group of two student teams, accompanied by Judith van Dijk, travelled to Queensland in September to compete in the 5th National Australian Soil Judging competition. The students, a mix of B Ag Sci, BSc and postgraduates had been practicing their soil description skills all semester with help from Roger McLenaghen, Judith van Dijk, Peter Almond and Carol Smith. They also raised over half the costs of competing in Australia through industry sponsorship, Lincoln University Soils Society bake sales and quiz nights. With thanks to the sponsors: CSER, FAR, Land Research Services, Landcare Research, Lincoln University, NZSSS, Ravensdown. All credit to a great effort by the teams. While the two Lincoln teams finished outside the top 5, Camilla Gardiner won the individual competition, with Josh Nelson 3rd and Verina Telling 6th. A full report can be found in this edition of Soil News.

Scion (Rotorua / Christchurch)

IUFRO, Freiburg

A Scion cohort attended the 125th anniversary IUFRO (International Union of Forest Research Organizations) congress in Freiburg, Germany, this September (Interconnecting Forests, Science and People). Simeon Smaill and Steve Wakelin both presented in the Forests, Soil and Water Interactions theme, where soil microbiology, ecosystem services, and biogeochemistry had a front-row seat. Steve W presented on "The phylogenetic and functional composition of forest soil ecosystems may be more susceptible to shifts in climate than land use", a talk based on previous work describing below-ground effects of changing land-use between oil palm, native forestry, and pasture. Simeon S presented work associated with 'bringing a microbial dimension to the management of current and future forests". Given the very high interest in climate and land-use change on forests and their role in the environment, these were very well received.

FGR Conference, Christchurch

There were several presentations from Scion staff at the 2017 FGR (**Forest Growers Research) conference that was** held from the 17th-19th of October **in Christchurch. Presentations and panel discussions covered a range of themes, with forest soils featuring** heavily on the agenda. Scion's soil-related research was able to inform various topics, with discussions including: nursery, fertiliser response, management of beneficial soil microbes and erosion tracking/management.

Ashley Dene

Scion soil scientists (Amanda Matson, Loretta Garrett and Steve Wakelin) were recently hosted by Prof. Keith Cameron (Lincoln University) at the Ashley Dene station. The Scion team were shown the SCALAR system (Suction Cup and Lysimeter Array), including the automated suction cup lysimeters and the large/very large intact lysimeter units. The team enjoyed the visit and the view of the Lismore stony silt loam. Scion, in collaboration with Prof. Brian Strahm from Virginia Polytechnic Institute and State University, are setting up lysimeters in plantation forests to measure movement of nutrients through soil. For the most part, plantation forests are considered 'closed nutrient ecosystems' however understanding critical windows of potential vulnerability remains an important component for the sector's social licence to operate.

Photo: Loretta Garrett (left), Amanda Matson (centre) (both Scion) and Keith Cameron (Lincoln Uni) inspecting the lysimeter drainage chambers at Ashley Dene.

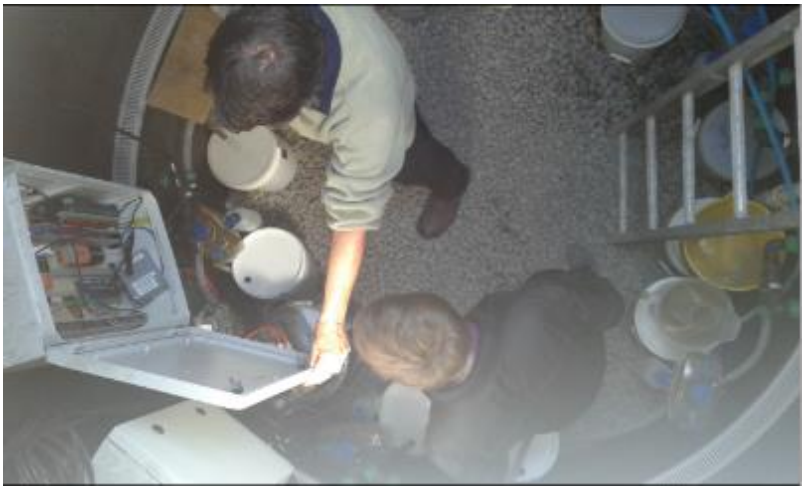


Photo: Amanda Matson and Scott Graham within the very large lysimeter collection access chamber.

Accelerator Trial Site in Dunedin

A first-rotation planted forest in Dunedin was visited by Simeon Smaill, Peter Clinton, Loretta Garrett and Amanda Matson in November to assess the site for the 6th Accelerator Trial installation. The Accelerator Trial series has been initiated under the Growing Confidence in Forestry's Future MBIE programme (https://gcff.nz/). The field trials aim to sustainably improve planted forest productivity by addressing site limitations. Due to climate change, the Dunedin site has been identified as being under increasing drought risk over the next planted forest rotation. Given the long-term nature of management decisions in forestry (i.e. a 3-decade cycle), planning for a drier climate during the next rotation starts before the current forest is harvested. Treatments to increase soil organic matter and soil water holding capacity are currently being planned with the forest company, so that these can be integrated into how the forest is harvested and what site preparation management is used.

Photo: Loretta Garrett investigating a soil pit.

P.S. If you are interested in becoming involved in a regional conference relating to 'Our fragile soils: sustaining ecosystem function", please be in contact.

Special feature on soils and climate change

Soil News Policy

Work to address Soils in MPI

MPI has a number of projects and programmes that seek to address soil and its uses. These range from strategic through research on soil issues, to operational activities that support soils.

Strategic Activities
These commenced several years ago, initially looking at comprehensive reviews on nutrients and subsequently soils research. In the last year, they have morphed into a broader soils programme within MPI.

MPI chairs the Cadmium Management Group which has been looking at the impact of cadmium and addressing its long term accumulation in soils, plants and food. An evaluation of the impacts will be conducted soon.

MPI and MfE are collectively engaged in the freshwater reforms and addressing the key land derived contaminants of nitrogen, phosphorus, e coli and sediment.

Research into Soils
There are a number of research projects that relate directly or indirectly to soils. This includes greenhouse gas inventory research projects looking at soil carbon. The work will develop a national framework to account for soil carbon stocks under different farm management practices, both on lowland and upland areas. Other practices such as the impact of irrigation on soil carbon are also being addressed.
Primary Growth Partnership projects are looking at improved nutrient management particularly through aircraft fertiliser application in hill country. Numerous Sustainable Farming Fund projects have a soils theme as well.

The Cadmium Management Group have supported a two year project looking at the impact of different soils on cadmium content in various crops, seeking to understand the key soil and plant factors affect cadmium content.

The Sustainable Land Management and Climate Change research programme has funded many projects related to soil and climate change over the past 10 years. These include methods of measurement of soil carbon, nitrous oxide measurement under various environmental conditions, assessment of nitrous oxide and ammonium inhibitors, assessment of soil services under climate change as well as nitrogen cycling. Other areas include use of biochar, modelling of soil carbon, review of soil erosion and potential impacts of climate change, and the impacts of irrigation on soil carbon.

Operational Activities
MPI administers a number of forestry programmes that seek to encourage forestry as well as reduce hill land soil erosion. These include the Afforestation Grants Scheme, Permanent Forest Sinks Initiative, and the Hill Country Erosion Fund. All are for preserving the soils in our erosion prone land. MPI is also engaged in the development of the National Environmental Standard for Forest Management which has a strong component seeking to maintain soils under forest land.

Gerald Rys and Philip Wiles

Meet the student – Anne Wecking

It is all my mum's fault! Each day after school, she let my brothers and me play in the "dirt" right there in the backyard of our house. How well I remember the little patch of soil sitting underneath our swing. Today, I know that the soil was of silt-loam texture, thanks to studying physical geography, landscape ecology and soil sciences in Hannover, Germany. Twenty years ago, however, we simply loved turning the soil patch into a mud-puddle, tossing and rolling around in the dirt.

I believe that these experiences must have had a recognisable impact on my urge to understand the living environment and its soils. Hands on and dirty fingers. Since then, my passion has become addictive: I have been to university and beyond; lived in Manchester to study glaciers, conducted an internship at AgResearch in Palmerston North, and bought a wild horse in Tunkhel, Mongolia, while taking part in foreign development aid activities. With time my experiences grew and the scientific equipment to play with got fancier - from using a shovel to dig soil profiles to learning how to operate a quantum-cascade-laser (QCL) at present day.

The QCL is located on Troughton Farm close to Matamata. Its data will serve as the fundament for my PhD study, which I started at the University of Waikato in June 2017. The core of the research is wrapped around a challenge that is well-acknowledged but has remained uninvestigated on the greater paddock scale: "*Nitrous oxide (N_2O) emissions from grazed pastoral land*". Whereas other greenhouse gas species, such as carbon dioxide and methane, have been quantified by eddy covariance (EC) techniques in the last decade; capturing N_2O emissions using the EC approach was inhibited by a lack of suitable detection devices. But… it is not anymore! The QCL provides data ten times a second on the hectare scale. By now, it has been operating for a year's time, and the data look rather exciting! What an appealing opportunity for me to settle back to New Zealand and to learn – a lot – under the supervision of Louis Schipper and Dave Campbell funded by the NZAGRC (New Zealand Agricultural Greenhouse Gas Research Centre).

18.000 km distance in between New Zealand and Germany – if my mum had known that her daughter would one day aim to identify the response of fertilisation, grazing intensity and sward diversity on paddock scale N_2O emissions to improve national greenhouse gas inventories on the other side of the globe… Probably, she would not have let her child play in the dirt!

Research team website:
https://waiber.com/
Some more information about the research:
https://farmersweekly.co.nz/section/dairy/view/laser-throws-light-on-emissions
http://www.nzagrc.org.nz/nitrous-oxide,listing,418,laser-has-bright-future-in-nitrous-oxide-emissions-measurement.html

One question, three answers

"Climate change is an issue that presents great scientific and economic complexity, some very deep uncertainties, profound ethical issues, and even lack of agreement on what the problem is" (Michael Toman). What do you think is the best way that New Zealand science, especially soil science, can best participate in tackling the issue of climate change?

"I believe the most effective way NZ science can participate in tackling the issue of climate change is to continue gathering data to inform the discussion. More information will reduce uncertainty and hopefully result in greater agreement within the scientific community. NZ soil science, in particular, I believe is best to focus on tackling local complexities to identify effective ways to reduce soil derived greenhouse gases from NZ systems. (And yes I agree the economic and ethical issues are huge – although that wasn't the question)"

Sheree Balvert, PhD Student

"Working with other scientists around the world and stake holders to come up with practical soil-based solutions so that the farming industry can adopt to reduce the greenhouse gas foot print of the farming systems."

Professor Hong J Di

"With rich knowledge in disciplines of soil science, our soil science community has played a very important role in increasing land production in the past decades. Now we are facing a new challenge with global climate change and environmental degradation. We, as soil and agricultural scientists, will again play a leading role in meeting the challenge. We have already started numerous research activities related to the development of strategies to fully understand the processes in soil that lead to emission of greenhouse gases that contribute to climate change. We are currently identifying techniques to accurately measure emissions and learning to manipulate the processes to reduce emissions without affecting productivity. We need to also work on identifying strategies to adapt to a warmer climate and more severe weather pattern. We will continue do so and we will also need to be more closely working with the international science community to share knowledge and skills to achieve the long-term global objective of reducing the adverse effects of climate change."

Dr Jiafa Luo

Climate change in the News:

Sugar planet: rising CO2 adds carbs to crops
http://www.radionz.co.nz/national/programmes/thiswayup/audio/201860485/sugar-planet-rising-co2-adds-carbs-to-crops

Media release: Climate change threatens health of New Zealanders in varied ways
https://royalsociety.org.nz/news/climate-change-threatens-health-of-new-zealanders-in-varied-ways/

Our atmosphere and climate 2017 http://www.mfe.govt.nz/publications/environmental-reporting/our-atmosphere-and-climate-2017

Tackling Climate Change with an Emissions Trading Scheme -from Motu Research http://motu.nz/our-work/environment-and-resources/emission-mitigation/emissions-trading/tackling-climate-change-with-an-emissions-trading-scheme

Open soil science: technology is helping us discover the mysteries under our feet
http://theconversation.com/open-soil-science-technology-is-helping-us-discover-the-mysteries-under-our-feet-81727?utm_source=twitter&utm_medium=twitterbutton

Vei lomani: Fijians fighting climate change http://www.worldbank.org/en/news/feature/2017/11/10/fijians-fighting-climate-change?cid=ECR_E_NewsletterWeekly_EN_EXT

Related Society Notices

Royal Society Te Apārangi launches report on the impacts of climate change on New Zealander's health

Dear Constituent Organisations

As you know, one of the functions of the Royal Society of New Zealand, under its Act of Parliament, is to provide expert advice on important public issues to the Government and the community.

Many factors that contribute to the health of New Zealanders will be affected by climate change. Direct effects of climate change such as increased exposure to heat waves and weather events, including flooding and fires, will affect our health but there will also be indirect effects, such as reduced water safety or challenges to our mental health.

Today, we have released information to raise awareness about the implications of climate in New Zealand on our health. The report, *Human Health Impacts of Climate Change for New Zealand*, is the third in the series produced by Royal Society Te Apārangi looking at climate change from New Zealand's perspective. The first report *Implications of Climate Change for New Zealand* summarised the findings of what changes we can expect and the second *Transition to a Low-carbon Economy for New Zealand* looked at the options for mitigating climate change through reducing our emissions of greenhouse gases.

To download the report and accompanying infographic, go to www.royalsociety.org.nz/climate-change-health . I hope you find them useful and please share them with anyone you think may find them of interest. If you have any feedback or comment in relation to these issues, please send them to Dr Marc Rands in our expert advice team (marc.rands@royalsociety.org.nz).

Yours sincerely

Dr Andrew Cleland FRSNZ
Chief Executive

FROM THE DESK OF RATTAN LAL

Viewpoint 11.2017

1st November 2017

Sub: The Solutions Under Foot

Fellow Soil Scientists,

A critical appraisal of the state-of-the-soil sciences at the universities around the world indicates that enrolments in classes are down, accredited graduate degrees are rare, number of faculty members are 5 to 10 compared with 20 to 25 a few decades ago, no advocacy groups are knocking at the doors of administration for replacement of the retiring professors, and there are no specific budget lines for funding research under the auspices of national science foundations. Alas, these trends are in strong contrast to the global estimates of 16 deaths per minute attributed to hunger and malnutrition, increasing risks of warming climate and depleting aquifers, soil erosion by water of 36 Gt annually, and the exacerbating eutrophication and non-point source pollution of water bodies. Yet, science and profession of soil have a bright future. Soil and its sustainable management are on global political agenda (COP21, Paris; COP22, Marrakech; COP23, Bonn). We must seize the moment, avail the opportunities, bring about the paradigm shift, and prepare the future generations of soil scientists to manage soil for addressing the societal needs. To attract the best and the brightest into the soil science classes, the respect and stature of the profession must be restored. Students should feel proud of being soil scientists and eager and enthusiastic to apply their skills to enhance the wellbeing of humanity and planet Earth. Soil science curricula, at all levels from primary school to the graduate education, must prepare the next generations in theory, practice, economics and policy of soil management for effectively addressing the present and emerging global issues. In addition to understanding the basic principles, soil scientists must also communicate the knowledge to citizenry and policymakers while cooperating with other disciplines (e.g., chemistry, physics, biology climatology, geology, public health) to ensure that science and practice of soil is appropriately integrated in multi-disciplinary programs. The goal of education is to develop passion for curiosity and discovery, inculcate self-drive and respect; promote critical thinking and originality; enhance integrity and values; strengthen persistence and determination; and build capacity for innovation and new frontiers. We have the privilege of providing training to the coming generations about the truism that:

"**Soil matters, and the solutions to global issues lie under foot".**

Sincerely,

Rattan Lal,
President, International Union of Soil Sciences

Abstracts

Correlating tephras and cryptotephras using glass compositional analyses and numerical and statistical methods: review and evaluation

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Abstract

We define tephras and cryptotephras and their components (mainly ash-sized particles of glass ± crystals in distal deposits) and summarize the basis of tephrochronology as a chronostratigraphic correlational and dating tool for palaeoenvironmental, geological, and archaeological research. We then document and appraise recent advances in analytical methods used to determine the major, minor, and trace elements of individual glass shards from tephra or cryptotephra deposits to aid their correlation and application. Protocols developed recently for the electron probe microanalysis of major elements in individual glass shards help to improve data quality and standardize reporting procedures. A narrow electron beam (diameter ~3–5 μm) can now be used to analyze smaller glass shards than previously attainable. Reliable analyses of 'microshards' (defined here as glass shards <32 μm in diameter) using narrow beams are useful for fine-grained samples from distal or ultra-distal geographic locations, and for vesicular or microlite-rich glass shards or small melt inclusions. Caveats apply, however, in the microprobe analysis of very small microshards (≤~5 μm in diameter), where particle geometry becomes important, and of microlite-rich glass shards where the potential problem of secondary fluorescence across phase boundaries needs to be recognised. Trace element analyses of individual glass shards using laser ablation inductively coupled plasma-mass spectrometry (LA-ICP-MS), with crater diameters of 20 μm and 10 μm, are now effectively routine, giving detection limits well below 1 ppm. Smaller ablation craters (<10 μm) can be subject to significant element fractionation during analysis, but the systematic relationship of such fractionation with glass composition suggests that analyses for some elements at these resolutions may be quantifiable. In undertaking analyses, either by microprobe or LA-ICP-MS, reference material data acquired using the same procedure, and preferably from the same analytical session, should be presented alongside new analytical data.

In part 2 of the review, we describe, critically assess, and recommend ways in which tephras or cryptotephras can be correlated (in conjunction with other information) using numerical or statistical analyses of compositional data. Statistical methods provide a less subjective means of dealing with analytical data pertaining to tephra components (usually glass or crystals/phenocrysts) than heuristic alternatives. They enable a better understanding of relationships among the data from multiple viewpoints to be developed and help quantify the degree of uncertainty in establishing correlations. In common with other scientific hypothesis testing, it is easier to infer using such analysis that two or more tephras are different rather than the same. Adding stratigraphic, chronological, spatial, or palaeoenvironmental data (i.e. multiple criteria) is usually necessary and allows for more robust correlations to be made. A two-stage approach is useful, the first focussed on differences in the mean composition of samples, or their range, which can be visualised graphically via scatterplot matrices or bivariate plots coupled with the use of statistical tools such as distance measures, similarity coefficients, hierarchical cluster analysis (informed by distance measures or similarity or cophenetic coefficients), and principal components analysis (PCA). Some statistical methods (cluster analysis, discriminant analysis) are referred to as 'machine learning' in the computing literature. The second stage examines sample variance and the degree of compositional similarity so that sample equivalence or otherwise can be established on a statistical basis. This stage may involve discriminant function analysis (DFA), support vector machines (SVMs), canonical variates analysis (CVA), and ANOVA or MANOVA (or its two-sample special case, the Hotelling two-sample T^2 test). Randomization tests can be used where distributional assumptions such as multivariate normality underlying parametric tests are doubtful.

Compositional data may be transformed and scaled before being subjected to multivariate statistical procedures including calculation of distance matrices, hierarchical cluster analysis, and PCA. Such transformations may make the assumption of multivariate normality more appropriate. A sequential procedure using Mahalanobis distance and the Hotelling two-sample T^2 test is illustrated using glass major element data from trachytic to phonolitic Kenyan tephras. All these methods require a broad range of high-quality compositional data which can be used to compare 'unknowns' with reference (training) sets that are sufficiently complete to account for all possible correlatives, including tephras with heterogeneous glasses that contain multiple compositional groups. Currently, incomplete databases are tending to limit correlation efficacy. The development of an open, online global database to facilitate progress towards integrated, high-quality tephrostratigraphic frameworks for different regions is encouraged.

Quaternary Science Reviews (2017) **175,** 1-44. https://doi.org/10.1016/j.quascirev.2017.08.003

Recent Scion-authored publications

Tao, R., Wakelin, S.A., Liang, Y., Hu, B., Chu, G. (2018) Nitrous oxide emission and denitrifier communities in drip-irrigated calcareous soil as affected by chemical and organic fertilizers (2018) Science of the Total Environment, 612, pp. 739-749. DOI: 10.1016/j.scitotenv.2017.08.258

Alizadeh, H., Kandula, D.R.W., Hampton, J.G., Stewart, A., Leung, D.W.M., Edwards, Y., Smith, C. Urease producing microorganisms under dairy pasture management in soils across New Zealand (2017) Geoderma Regional, 11, pp. 78-85.

Evidence for soil carbon enhancement through deeper mouldboard ploughing at pasture renovation on a Typic Fragiaqualf

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Abstract
Permanent pastures require periodic renewal (cultivation and resowing) to maintain their productive potential, which involves a short-term carbon (C) loss. Normal cultivation (ploughing or discing) often involves only the top 10–15 cm, or less, of pasture soils. A regrassing field trial with ryegrass plus white clover swards was established in 2011 to assess the effect of deeper ploughing (25 cm) on C storage in an imperfectly drained soil (Tokomaru silt loam). The site was core sampled (0–30 cm depth) 2 and 4 years (i.e. in 2013 and 2015 respectively) after cultivation and regressing (soil inversion treatment) to assess changes in soil C content at different depths. At both times, an adjacent uncultivated ryegrass paddock (undisturbed pasture treatment) under similar grazing intensity was also sampled and C stocks were compared. Profiles of cultivated soils (soil inversion) showed higher ($P < 0.01$) C stocks than the adjacent permanent pasture at the nominal 15–25 and 25–30 cm depths and significantly lower ($P < 0.01$) C stocks in the topsoil (nominal 0–5 cm depth) for both years sampled (2013, 2015). These findings imply that the differences (inversion – pasture) were consistent 4 years after cultivation and deep ploughing at pasture renewal had resulted in an overall increase in soil C mass to approximately 30 cm of ~18% (13.9 MgC ha^{-1}; equivalent soil mass 3701Mg soil ha^{-1}) compared with not undertaking the regrassing. This gain in soil C may be temporary, but in a period of 4 years it has significantly increased the net residence time of C in soil related to soil inversion.

Citation: Calvelo Pereira, R., Hedley, M.J., Camps Arbestain, M., Bishop, P., Enongene, K.E., Otene, I.J.J., 2017. Evidence for soil carbon enhancement through deeper mouldboard ploughing at pasture renovation on a Typic Fragiaqualf. Soil Research, https://doi.org/10.1071/SR17039.

Conferences:

BONARES 2018 Conference, Berlin , 26-28 February 2018
The conference brings together researchers from all disciplines of soil science to discuss the functionality of soil ecosystems and how to develop strategies towards sustainable soil management. A sustainable bioeconomy requires integration of soil productivity with a wide range of other soil functions including nutrient cycling, carbon storage, water retention and filtering as well as being the habitat of a myriad of organisms and their activities. For sustainable soil management, we need to understand soils at a systemic level and to assess their value in a socio-economic framework. JRC participates in the advisory board of BONARES. Abstract submission deadline: November 1st, 2017. **http://www.bonares2018.de/**

Australasian Environmental Isotope Conference: **26 March, 2018**. At AEIC2018 attendees will engage on a wide variety of environmental applications of isotopes. Deadline for abstract submission Friday 15 December. **http://www.confer.co.nz/aeic2018/**

Pacific Climate Change Conference 2018: The second Pacific Climate Change Conference will bring together a broad range of voices on climate change, from the science to the impacts to the policy and public implications. Deadline for early bird registration **Friday 15 December**. **http://www.confer.co.nz/pcc2018/**

World Congress of Soil Science 2018: On behalf of the Organizing Committee of the 21WCSS, we are pleased to invite you to join this meeting and all members of your society. (https://www.facebook.com/search/top/?q=21st%20world%20congress%20of%20soil%20science www.21wcs.org). Abstract submission Ends by 20/01/2018
https://www.21wcss.org/

3 – 9 September 2018

http://17wfc.csp.escience.cn/dct/page/1

The north-east of China has been traditionally the centre of fertilizer production and fertilizer research so that Shenyang was the predestined location to host the 17th World Fertilizer Congress. Food security and food safety are of prime interest on a global scale as are environmental aspects and soil protection issues. An increase of fertilizer rates for meeting these objectives can only be constructive if the nutrient supply is the yield limiting factor whereas a surplus can be regularly found in the nutrient balances of intensive agricultural production systems which has to be seen critically with a view to groundwater pollution with nitrates and discharge of phosphorus by surface run-off and erosion. On big livestock enterprises the contamination of slurries and manures with antibiotics poses a risk for soil and human health, which strengthens the need for alternative treatments and quality assessment of farmyard manure and recycled fertilizer products such as digestates which process these resources. The future of fertilizers will be closely linked to a significant increase in nutrient utilization efficiency which implies the use of fully plant available nutrient resources, a purely demand-driven fertilizer input and a reduction of nutrient losses to the environment. Parallel the pressure on agriculture to employ recycled fertilizer products will increase as the disposal of wastes is costly and re-utilization of nutrients politically encouraged. This makes research with respect to the innocuousness of fertilizer products an important branch in order to assess putative risks for the quality of soils and plants. Innovations in the mineral fertilizer production sector will have to focus on resource efficiency which starts for instance in case of phosphorus with mining and extraction of precious metals such as uranium and lanthanides besides the nutrient itself.
Traditionally the World Fertilizer Congress is open to all aspects related to plant nutrition, soil fertility, fertilisation and fertilizers. We invite especially contributions on **various aspects of global interest**. The major clusters are:

- Novel fertilizer products
- Precious rock material: phosphorus, uranium and lanthanides
- Agronomic and environmental issues of recycled fertilizer products
- Dropped aspects of droppings
- Wastewater against starving and parched plants
- Precision agriculture or when less is more
- Fertilization and soil health
- Fertilization and environment

In invited lectures internationally highly acknowledged scientists will present cutting-edge research and state-of-the-art facts for each of the themes. The World Fertilizer Congress brings together fertilizer manufacturers and scientists from all over the world interested in the specifics of plant nutrition and fertilization. Participants will leave the symposium having shared ideas, having contributed to the body of knowledge concerning fertilizer use, and having made friends and contacts for future research.

18 – 23 November 2018

ASA National Soils Conference 2018

The National Soils Conference 2018 will be held at the Hyatt in Canberra between the 18th and 23rd of November. The conference will have the theme *Soil: The key to past, present and future* and we expect that the conference will be a great opportunity for you to showcase your work and to network with your colleagues. There will be significant emphasis on the practice of soil science. Sponsorship opportunities will be available, and a prospectus will be sent to each member of the society.

http://www.soilscienceaustralia.com.au/new/404-2018-national-soils-conference

2018 NZSSS Conference

3-6 December 2018, Napier, New Zealand

Soils2018 will be held in Napier from 3 to 6 December 2018. This biannual conference is a must attend event organised by the NZ Society of Soil Science and OnCue Conferences, and will cover a range of topics under the theme **'diverse soils - productive landscapes'**. The wider Hawke's Bay region is home to a diverse mix of primary production, from forestry and sheep and beef production on the coastal and northern hill country, intensive dairy systems on the flat and rolling terraces abutting the ranges, to highly productive horticulture and cropping on the fertile Heretaunga and Ruataniwha plains. During the 4-day conference you'll get a chance to hear from a wide range of researchers, industry leaders, consultants and advisors, regulators and land managers on all things soil-related, anchored by a range of exciting keynotes focused on soilscapes, food production and hot topics around water use and environmental indicators. The conference will be held at the new Napier War Memorial Conference Centre, a great venue on Napier's iconic Marine Parade that looks out on Cape Kidnappers and the city coastline. Centrally located, the NWMCC is across the road from local hotels, restaurants and the downtown shopping precinct. Around the conference you'll have a chance to connect with your colleagues during social activities at some of the Bay's well known wineries, and look at a wide range of offerings from our event sponsors. A flier has been created explaining key dates and a conference website has been developed: http://nzssconference.co.nz/. In the interim, we'd like to hear your ideas for the science programme – send any suggestions to Diana Selbie Diana.Selbie@agresearch.co.nz.

Rebecca Withnall and Paul Johnstone, co-convenors
Lea Boodee, On-Cue Conference

Soil-art exhibition - invitation and advance warning!

After our successful inaugural soil art exhibition at the Hamilton conference in 2014 we are planning to again hold a soil-related art exhibition at our NZSSS conference in Napier in December 2018. We would like to showcase the widest possible interpretation of soil-related art, produced by you, the New Zealand Soil Science community.

Everyone can participate - all forms of art will be accepted including: sculpture from soil/clay/earth materials or with a soil-related theme, paintings related to soils or made using soil materials, poems or short statements that can be displayed on a wall poster, photography, fibre art, computer generated art, soil peels, sand paintings, cartoons – everything is possible.

WHY??

- Art is fun to create and to view.
- Art is a way to reach a non-science audience with messages about the importance, beauty, vulnerability and versatility of soil.
- Art (done by the science community) is a means to break down stereotypes about the sorts of people who are scientists.

Thus, the challenge is to get creative. Start now while there is lots of time to work on it. There is still time for you to join a pottery, art, or sculpture class to get some upskilling to create your masterpiece. Do something to show off some of your interpretations of soil or soil materials.

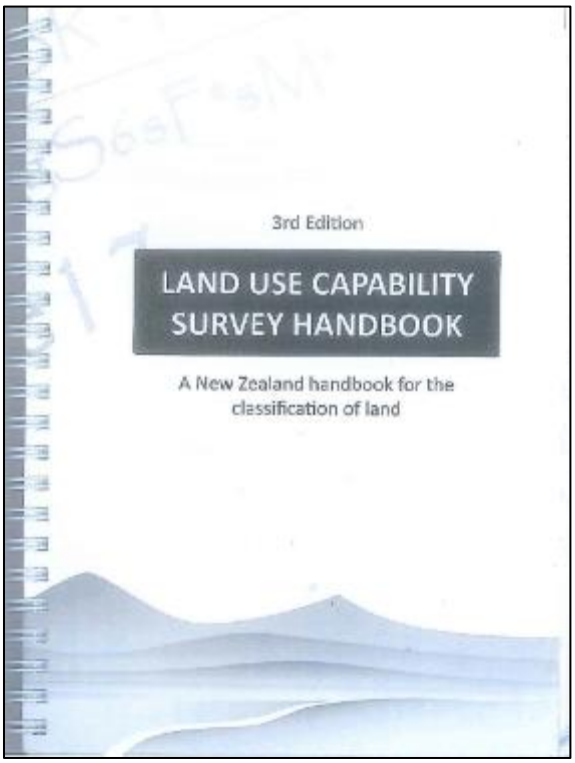
Get committed, let Megan Balks megan.balks@waikato.ac.nz or Diana Selbie diana.selbie@agresearch.co.nz know if you plan to contribute so we can ensure we have enough suitable display space.

The conference website **www.luwq2019.dk** will be available by end April 2018

Opportunities

Call for applications | 2018 Zonta Science Award. This is a post-doctoral Award for New Zealand women scientists, aimed at an emerging scientist rather than someone well-established in their career. Deadline for applications Monday 5 February 2018. http://zontascience.org.nz/

Land Use Capability Handbook



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If you would like a copy please email: Isabelle.vanderkolk@agresearch.co.nz

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